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American Association of Economic Entomologists

(Organized in 1889)

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LIST OF MEETINGS AND PAST OFFICERS

First Annual Meeting, Washington, D. C., Nov. 12–14, 1889. President, C. V. Riley; First Vice-President, S. A. Forbes; Second Vice-President, A. J. Cook; Secretary, John B. Smith.

Second Annual Meeting, Champaign, Ill., Nov. 11–13, 1890. (The same officers had charge of this meeting.)

Third Annual Meeting, Washington, D. C., Aug. 17–18, 1891. President, James Fletcher; First Vice-President, F. H. Snow; Second Vice-President, Herbert Osborn; Secretary, L. O. Howard.

Fourth Annual Meeting, Rochester, N. Y., Aug. 15–16, 1892. President, J. A. Lintner; First Vice-President, S. A. Forbes; Second Vice-President, J. H. Comstock; Secretary, F. M. Webster.

Fifth Annual Meeting, Madison, Wis., Aug. 14–16, 1893. President, S. A. Forbes; First Vice-President, C. J. S. Bethune; Second Vice-President, John B. Smith; Secretary, H. Garman.

Sixth Annual Meeting, Brooklyn, N. Y., Aug. 14–15, 1894. President, L. O. Howard; First Vice-President, John B. Smith; Second Vice President, F. L. Harvey; Secretary, C. P. Gillette.

Seventh Annual Meeting, Springfield, Mass., Aug. 27–28, 1895. President, John B. Smith; First Vice-President, C. H. Fernald; Secretary, C. L. Marlatt.

Eighth Annual Meeting, Buffalo, N. Y., Aug. 21–22, 1896. President, C. H. Fernald; First Vice-President, F. M. Webster; Second Vice-President, Herbert Osborn; Secretary, C. L. Marlatt.

Ninth Annual Meeting, Detroit, Mich., Aug. 12–13, 1897. President, F. M. Webster; First Vice-President, Herbert Osborn; Second Vice-President, Lawrence Bruner; Secretary, C. L. Marlatt.

Tenth Annual Meeting, Boston, Mass., Aug. 19–20, 1898. President, Herbert Osborn; First Vice-President, Lawrence Bruner; Second Vice-President, C. P. Gillette; Secretary, C. L. Marlatt.

Eleventh Annual Meeting, Columbus, Ohio, Aug. 18–19, 1899. President, C. L. Marlatt; First Vice-President, Lawrence Bruner; Second Vice-President, C. P. Gillette; Secretary, A. H. Kirkland.

Twelfth Annual Meeting, New York, N. Y., June 22–23, 1900. President, Lawrence Bruner; First Vice-President, C. P. Gillette; Second Vice-President, E. H. Forbush; Secretary, A. H. Kirkland.

Thirteenth Annual Meeting, Denver, Col., Aug. 23–24, 1901. President, C. P. Gillette; First Vice-President, A. D. Hopkins; Second Vice-President, E. P. Felt; Secretary, A. L. Quaintance.

Fourteenth Annual Meeting, Pittsburg, Pa., June 27–28, 1902. President, A. D. Hopkins; First Vice-President, E. P. Felt; Second Vice-President, T. D. A. Cockerell; Secretary, A. L. Quaintance.

Fifteenth Annual Meeting, Washington, D. C., Dec. 26–27, 1902. President, E. P. Felt; First Vice-President, W. H. Ashmead; Second Vice-President, Lawrence Bruner; Secretary, A. L. Quaintance.

Sixteenth Annual Meeting, St. Louis, Mo., Dec. 29–31, 1903. President, M. V. Slingerland; First Vice-President, C. M. Weed; Second Vice-President, Henry Skinner; Secretary, A. F. Burgess.

Seventeenth Annual Meeting, Philadelphia, Pa., Dec. 29–30, 1904. President, A. L. Quaintance; First Vice-President, A. F. Burgess; Second Vice-President, Mary E. Murtfeldt; Secretary, H. E. Summers.

Eighteenth Annual Meeting, New Orleans, La., Jan. 1–4, 1906. President, H. Garman; First Vice-President, E. D. Sanderson; Second Vice-President, F. L. Washburn; Secretary, H. E. Summers.

Nineteenth Annual Meeting, New York, N. Y., Dec. 28–29, 1906. President, A. H. Kirkland; First Vice-President, W. E. Britton; Second Vice-President, H. A. Morgan; Secretary, A. F. Burgess.

Twentieth Annual Meeting, Chicago, Ill., Dec. 27–28, 1907. President, H. A. Morgan; First Vice-President, H. E. Summers; Second Vice-President, W. D. Hunter; Secretary, A. F. Burgess.

Twenty-first Annual Meeting, Baltimore, Md., Dec. 28–29, 1908. President, S. A. Forbes; First Vice-President, W. E. Britton; Second Vice-President, E. D. Ball; Secretary, A. F. Burgess.

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Ball, E. D., Agricultural Experiment Station, Logan, Utah.
Banks, C. S., Manila, P. I.
Banks, Nathan, U. S. Department of Agriculture, Washington, D. C.
Benton, Frank, 925 N Street, N. W., Washington, D. C.

Bethune, C. J. S., Guelph, Ontario, Canada.
Bishopp, F. C., U. S. Department of Agriculture, Washington, D. C.
Britton, W. E., New Haven, Conn.
Brooks, Fred E., Agricultural Experiment Station, Morgantown, W. Va.
Bruner, Lawrence, Agricultural Experiment Station, Lincoln, Neb.
Burgess, Albert F., U. S. Department of Agriculture, Washington, D. C.
Burke, H. E., U. S. Department of Agriculture, Washington, D. C.
Busck, August, U. S. Department of Agriculture, Washington, D. C.
Caudell, A. N., U. S. Department of Agriculture, Washington, D. C.
Chambliss, C. E., U. S. Department of Agriculture, Washington, D. C.
Chittenden, F. H., U. S. Department of Agriculture, Washington, D. C.
Cockerell, T. D. A., University of Colorado, Boulder, Col.
Comstock, J. H., Cornell University, Ithaca, N. Y.
Conradi, A. F., Clemson College, S. C.
Cook, A. J., Pomona College, Claremont, Cal.
Cook, Mel. T., Newark, Del.
Cooley, R. A., Agricultural Experiment Station, Bozeman, Mont.
Coquillett, D. W., U. S. Department of Agriculture, Washington, D. C.
Cordley, A. B., Agricultural Experiment Station, Corvallis, Oregon.
Cotton, E. C., Agricultural Experiment Station, Knoxville, Tenn.
Crawford, J. C., U. S. Department of Agriculture, Washington, D. C.
Dickerson, Edgar L., Agricultural Experiment Station, New Brunswick, N. J.
Dyar, H. G., U. S. National Museum, Washington, D. C.
Ehrhorn, E. M., Room 611, Ferry Building, San Francisco, Cal.
Felt, E. P., Geological Hall, Albany, N. Y.
Fernald, C. H., Agricultural College, Amherst, Mass.
Fernald, H. T., Agricultural College, Amherst, Mass.
Fiske, W. F., U. S. Department of Agriculture, Washington, D. C.
Forbes, S. A., University of Illinois, Urbana, Ill.
French, G. H., Normal Avenue, Carbondale, Ill.
Garman, H., Agricultural Experiment Station, Lexington, Ky.
Gibson, Arthur, Central Experimental Farm, Ottawa, Canada.
Gillette, C. P., Agricultural Experiment Station, Fort Collins, Col.
Girault, A. A., University of Illinois, Urbana, Ill.
Gossard, H. A., Agricultural Experiment Station, Wooster, Ohio.
Gregson, P. B., Blackfalds, Alberta, Northwest Territory, Canada.
Grossbeck, John A., Agricultural Experiment Station, New Brunswick, N. J.
Hart, C. A., Illinois State Laboratory of Natural History, Urbana, Ill.
Headlee, T. J., Agricultural Experiment Station, Manhattan, Kansas.
Heidemann, Otto, U. S. Department of Agriculture, Washington, D. C.
Herrick, Glen W., Agricultural Experiment Station, College Station, Texas.
Hinds, W. E., Agricultural Experiment Station, Auburn, Ala.
Hine, J. S., Ohio State University, Columbus, Ohio.
Holland, W. J., Carnegie Museum, Pittsburg, Pa.
Hooker, W. A., U. S. Department of Agriculture, Washington, D. C.
Hopkins, A. D., U. S. Department of Agriculture, Washington, D. C.
Houghton, C. O., Agricultural Experiment Station, Newark, Del.
Howard, L. O., U. S. Department of Agriculture, Washington, D. C.
Hunter, S. J., University of Kansas, Lawrence, Kan.
Hunter, W. D., U. S. Department of Agriculture, Washington, D. C.
Johnson, S. Arthur, State Agricultural College, Fort Collins, Colo.

Kellogg, Vernon L., Stanford University, Cal.
Kincaid, Trevor, University of Washington, Seattle, Wash.
Kirkaldy, G. W., Hawaiian Sugar Planters' Experiment Station, Honolulu, Hawaii.
Kirkland, A. H., 6 Beacon Street, Boston, Mass.
Kotinsky, J., Honolulu, Hawaii.
Lochhead, William, Macdonald College of Agriculture, Montreal, Canada.
Marlatt, C. L., U. S. Department of Agriculture, Washington, D. C.
Morgan, A. C., U. S. Department of Agriculture, Washington, D. C.
Morgan, H. A., University of Tennessee, Knoxville, Tenn.
Morrill, A. W., U. S. Department of Agriculture, Washington, D. C.
Moulton, Dudley, U. S. Department of Agriculture, Washington, D. C.
Murtfeldt, Miss M. E., Kirkwood, Mo.
Newell, Wilmon, State Crop Pest Commission, Baton Rouge, La.
Osborn, Herbert, Ohio State University, Columbus, Ohio.
Parrott, P. J., Agricultural Experiment Station, Geneva, N. Y.
Patch, Edith M., Agricultural Experiment Station, Orono, Me.
Pergande, Theodore, U. S. Department of Agriculture, Washington, D. C.
Perkins, R. C. L., Hawaiian Sugar Planters' Experiment Station, Honolulu, Hawaii.
Pettit, R. H., Agricultural Experiment Station, Agricultural College, Mich.
Phillips, E. F., U. S. Department of Agriculture, Washington, D. C.
Phillips, J. L., Agricultural Experiment Station, Blacksburg, Va.
Phillips, W. J., U. S. Department of Agriculture, Washington, D. C.
Pierce, W. Dwight, U. S. Department of Agriculture, Washington, D. C.
Popenoe, E. A., R. F. D. No. 2, Topeka, Kan.
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Quaintance, A. L., U. S. Department of Agriculture, Washington, D. C.
Quayle, H. J., Agricultural Experiment Station, Berkeley, Cal.
Reeves, George I., U. S. Department of Agriculture, Washington, D. C.
Riley, W. A., Cornell University, Ithaca, N. Y.
Ruggles, A. G., Agricultural Experiment Station, St. Anthony Park, Minn.
Rumsey, W. E., Agricultural Experiment Station, Morgantown, W. Va.
Sanborn, C. E., College Station, Tex.
Sanders, J. G., U. S. Department of Agriculture, Washington, D. C.
Sanderson, E. Dwight, Agricultural Experiment Station, Durham, N. H.
Saunders, William, Central Experimental Farm, Ottawa, Canada.
Schwarz, E. A., U. S. Department of Agriculture, Washington, D. C.
Sherman, Franklin, Jr., Division of Entomology, State Department of Agriculture, Raleigh, N. C.
Sirrine, F. A., 124 Sound Avenue, Riverhead, N. Y.
Skinner, Henry, Academy of Natural Sciences, Philadelphia, Pa.
Slingerland, M. V., Agricultural Experiment Station, Ithaca, N. Y.
Smith, J. B., Agricultural Experiment Station, New Brunswick, N. J.
Smith, R. I., West Raleigh, N. C.
Stedman, J. M., Agricultural Experiment Station, Columbia, Mo.
Summers, H. E., Agricultural Experiment Station, Ames, Iowa.
Surface, H. A., State Zoölogist, Harrisburg, Pa.
Symons, T. B., Agricultural Experiment Station, College Park, Md.
Taylor, E. P., Mountain Grove, Mo.
Titus, E. S. G., Agricultural Experiment Station, Logan, Utah.

Townsend, C. H. T., U. S. Department of Agriculture, Washington, D. C.
Troop, James, Agricultural Experiment Station, Lafayette, Ind.
Van Dine, D. L., Government Entomologist, Hawaiian Experiment Station, Honolulu, Hawaii.
Viereck, H. L., Detroit, Mich.
Walden, B. H., Agricultural Experiment Station, New Haven, Conn.
Washburn, F. L., Agricultural Experiment Station, St. Anthony Park, Minn.
Webster, F. M., U. S. Department of Agriculture, Washington, D. C.
Webster, R. L., Agricultural Experiment Station, Ames, Iowa.
Wheeler, Wm. M., Bussey Institution, Jamaica Plain, Boston, Mass.
Wilcox, E. V., Agricultural Experiment Station, Honolulu, Hawaii.
Woglum, R. S., U. S. Department of Agriculture, Washington, D. C.
Woodworth, C. W., Agricultural Experiment Station, Berkeley, Cal.
Worsham, E. L., Capitol Building, Atlanta, Ga.

ASSOCIATE MEMBERS

Adams, C. F., Fayetteville, Ark.
Ainslie, George G., Clemson College, S. C.
Back, E. A., Orlando, Fla.
Barber, H. S., U. S. Department of Agriculture, Washington, D. C.
Barber, T. C., State Crop Pest Commission, Baton Rouge, La.
Bartholomew, C. E., Iowa State College, Ames, Iowa.
Beckwith, H. M., Elmira, N. Y.
Bentley, Gordon M., University of Tennessee, Knoxville, Tenn.
Beutenmüller, Wm., American Museum of Natural History, New York, N. Y.
Braucher, R. W., U. S. Department of Agriculture, Washington, D. C.
Brues, C. T., Milwaukee Public Museum, Milwaukee, Wis.
Buck, J. E., Agricultural Experiment Station, Blacksburg, Va.
Bullard, W. S., 629 Water Street, Bridgeport, Conn.
Campbell, J. P., Athens, Ga.
Chase, W. W., State Board of Entomology, Atlanta, Ga.
Clifton, R. S., U. S. Department of Agriculture, Washington, D. C.
Condit, Ira J., California Polytechnic School, San Luis, Obispo, Cal.
Couden, F. D., U. S. Department of Agriculture, Washington, D. C.
Crosby, C. R., Cornell University, Ithaca, N. Y.
Currie, Rolla P., U. S. Department of Agriculture, Washington, D. C.
Cushman, R. A., U. S. Department of Agriculture, Washington, D. C.
Davis, J. J., Urbana, Ill.
Dean, George A., Kansas Agricultural College, Manhattan, Kan.
Dean, Harper, Jr., U. S. Department of Agriculture, Washington, D. C.
Doran, E. W., Belhaven College, Jackson, Miss.
Engle, Enos B., Department of Agriculture, Harrisburg, Pa.
Flynn, C. W., Assistant Entomologist, State Crop Pest Commission, Baton Rouge, La.
Fowler, Carroll, Duarte, Cal.
Franklin, H. J., University of Minnesota, St. Anthony Park, Minn.
Frost, H. L., Arlington, Mass.
Fullaway, D. T., Agricultural Experiment Station, Honolulu, Hawaii.
Gahan, A. B., College Park, Md.
Garrett, J. B., Assistant Entomologist, State Crop Pest Commission, Baton Rouge, La.

Gates, Burton N., U. S. Department of Agriculture, Washington, D. C.
Gifford, John, Princeton, N. J.
Goodwin, W. H., Agricultural Experiment Station, Wooster, Ohio.
Green, E. C., Brownsville, Texas.
Guilbeau, B. H., Baton Rouge, La.
Hammar, A. G., U. S. Department of Agriculture, Washington, D. C.
Hargitt, C. W., Syracuse University, Syracuse, N. Y.
Harrington, W. H., Postoffice Department, Ottawa, Canada.
Hayhurst, Paul, Bussey Institution, Jamaica Plain, Boston, Mass.
Hitchings, E. F., Augusta, Me.
Hodgkiss, H. E., Agricultural Experiment Station, Geneva, N. Y.
Hood, C. E., Dallas, Texas.
Hooker, C. W., Amherst, Mass.
Horton, J. R., Agricultural Experiment Station, Logan, Utah.
Houser, J. S., Santiago de las Vegas, Cuba.
Hudson, G. H., State Normal and Training School, Plattsburg, N. Y.
Hyslop, J. A., U. S. Department of Agriculture, Washington, D. C.
Isaac, John, Sacramento, Cal.
Jarvis, T. D., Guelph, Ontario, Canada.
Jenne, E. L., U. S. Department of Agriculture, Washington, D. C.
Jennings, A. H., Ancon, Canal Zone, Panama.
Johnson, Fred, U. S. Department of Agriculture, Washington, D. C.
Jones, Charles R., U. S. Department of Agriculture, Washington, D. C.
Jones, Paul R., U. S. Department of Agriculture, Washington, D. C.
Kelly, E. O. G., U. S. Department of Agriculture, Washington, D. C.
King, George B., Lawrence, Mass.
Knab, Frederick, U. S. National Museum, Washington, D. C.
Koebele, Albert, Alameda, Cal.
Kraus, E. J., U. S. Department of Agriculture, Washington, D. C.
Lewis, A. C., State Board of Entomology, Atlanta, Ga.
Lowe, F. B., U. S. Department of Agriculture, Washington, D. C.
Mackintosh, R. S., State Board of Horticulture, Auburn, Ala.
MacGillivary, A. D., Cornell University, Ithaca, N. Y.
Mann, B. P., 1918 Sunderland Place, Washington, D. C.
Marsh, H. O., U. S. Department of Agriculture, Washington, D. C.
Martin, George W., 1804 Grand Avenue, Nashville, Tenn.
McConnell, W. R., State College, Pa.
McCray, A. H., Ohio State University, Columbus, Ohio.
McMillan, D. K., U. S. Department of Agriculture, Washington, D. C.
Mosher, F. H., Melrose Highlands, Mass.
Ness, Henry, Iowa State College, Ames, Iowa.
Nicholson, John F., Stillwater, Okla.
Niswander, F. J., 519 East Seventeenth Street, Cheyenne, Wyo.
Paine, C. T., San José, Cal.
Palmer, R. M., Victoria, British Columbia.
Pearis, L. M., Agricultural Experiment Station, College Park, Md.
Piper, C. V., U. S. Department of Agriculture, Washington, D. C.
Popenoe, C. H., U. S. Department of Agriculture, Washington, D. C.
Price, H. L., Agricultural Experiment Station, Blacksburg, Va.
Price, Wm. J., Jr., Agricultural Experiment Station, Blacksburg, Va.
Randall, J. L., State Normal School, California, Pa.

Rane, F. W., State House, Boston, Mass.
Reed, E. B., Esquimault, British Columbia.
Reed, W. V., State Board of Entomology, Atlanta, Ga.
Rogers, D. M., 6 Beacon St., Boston, Mass.
Rolfs, P. H., Agricultural Experiment Station, Gainesville, Fla.
Rosenfeld, A. H., State Crop Pest Commission, Baton Rouge, La.
Runner, G. A., Oak Harbor, Ohio.
Russell, H. M., U. S. Department of Agriculture, Washington, D. C.
Sasscer, E. R., U. S. Department of Agriculture, Washington, D. C.
Satterthwait, A. F., Harrisburg, Pa.
Schoene, W. J., Geneva, N. Y.
Scott, W. M., U. S. Department of Agriculture, Washington, D. C.
Shafer, G. D., East Lansing, Mich.
Shaw, N. E., State Department of Agriculture, Columbus, Ohio.
Smith, C. P., Agricultural Experiment Station, Logan, Utah.
Smith, Harry S., U. S. Department of Agriculture, Washington, D. C.
Smith, L. M., Carbondale, Ill.
Southwick, E. B., Arsenal Building, Central Park, New York, N. Y.
Spooner, Charles, Middletown, N. Y.
Stene, A. E., Kingston, R. I.
Stiles, J. C., Blacksburg, Va.
Stimson, James, Santa Cruz, Cal.
Swenk, Myron H., University of Nebraska, Lincoln, Neb.
Swezey, O. H., Hawaiian Sugar Planters' Experiment Station, Honolulu, Hawaii.
Terry, F. W., Hawaiian Sugar Planters' Experiment Station, Honolulu, Hawaii.
Thaxter, Roland, 7 Scott Street, Cambridge, Mass.
Toumey, J. W., Yale Forest School, New Haven, Conn.
Tower, W. L., Porto Rico Experiment Station, Mayaguez, P. R.
Turner, W. F., Agricultural Experiment Station, Auburn, Ala.
Urbahns, T. D., U. S. Department of Agriculture, Washington, D. C.
Vickery, R. A., U. S. Department of Agriculture, Washington, D. C.
Webb, J. L., U. S. Department of Agriculture, Washington, D. C.
Weed, C. M., Lowell, Mass.
Weed, Howard E., Railroad Exchange Building, Chicago, Ill.
Weldon, G. P., Grand Junction, Col.
West, J. A., Urbana, Ill.
Wilson, H. F., U. S. Department of Agriculture, Washington, D. C.
Wood, H. P., Dallas, Texas.
Yothers, M. A., Agricultural Experiment Station, East Lansing, Mich.
Yothers, W. W., U. S. Department of Agriculture, Washington, D. C.
Young, D. B., Geological Hall, Albany, N. Y.

FOREIGN MEMBERS

Ballou, H. A., Imperial Department of Agriculture, Barbados, West Indies.
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Carpenter, Dr. George H., Royal College of Science, Dublin, Ireland.

Cholodkosky, Prof. Dr. N., Militär-Medicinische Akademie, St. Petersburg, Russia.
Collinge, W. E., 55 Newhall Street, Birmingham, England.
Danysz, J., Laboratoire de Parasitologie, Bourse de Commerce, Paris, France.
Enock, Fred, 42 Salisbury Road, Bexley, London, SE., England.
French, Charles, Department of Agriculture, Melbourne, Australia.
Froggatt, W. W., Department of Agriculture, Sydney, New South Wales.
Fuller, Claude, Department of Agriculture, Pietermaritzburg, Natal, South Africa.
Giard, A., 14 Rue Stanislaus, Paris, France.
Goding, F. W., Newcastle, New South Wales.
Grasby, W. C., 6 West Australian Chambers, Perth, West Australia.
Green, E. E., Royal Botanic Gardens, Peradeniya, Ceylon.
Helms, Richard, 136 George Street, North Sydney, New South Wales.
Herrera, A. L., Calle de Betlemitas No. 8, Mexico City, Mexico.
Hewett, C. Gordon, Manchester, England.
Horvath, Dr. G., Musée Nationale Hongroise, Budapest, Hungary.
Jablonowski, Josef, Entomological Station, Budapest, Hungary.
Lampa, Prof. Sven, Statens Entomologiska, Anstalt, Stockholm, Sweden.
Lea, A. M., Department of Agriculture, Hobart, Tasmania.
Leonardi, Gustavo, R. Scuola di Agricoltura, Portici, Italy.
Lounsbury, Charles P., Department of Agriculture, Cape Town, South Africa.
Mally, C. W., Department of Agriculture, Grahamstown, Cape Colony, South Africa.
Marchal, Dr. Paul, 16 Rue Claude Bernard, Paris, France.
Mokshetsky, Sigismond, Musée d'Histoire Naturelle, Simferopol, Crimea, Russia.
Mussen, Charles T., Hawkesbury Agricultural College, Richmond, New South Wales.
Nawa, Yashushi, Entomological Laboratory, Kyomachi, Gifu, Japan.
Newstead, Robert, University School of Tropical Medicine, Liverpool, England.
Porchinski, Prof. A., Ministère de l'Agriculture, St. Petersburg, Russia.
Porter, Carlos E., Casilla 2352, Santiago, Chili.
Pospielow, Dr. Walremar, Station Entomologique, Rue de Boulevard, No. 9, Kiew, Russia.
Reed, Charles S., Mendoza, Argentine Republic, South America.
Reed, E. C., Museo, Concepcion, Chile.
Reuter, Dr. Enzio, Agrikultur-Economiska Försöksamstalten, Helsingfors, Finland.
Ritzema Bos, Dr. J., Agricultural College, Wageningen, Netherlands.
Sajo, Prof. Karl, Gödöllö-Veresegyház, Hungary.
Schoyen, Prof. W. M., Zoölogical Museum, Christiania, Norway.
Shipley, Prof. Arthur E., Christ's College, Cambridge, England.
Silvestri, Dr. F., R. Scuola Superiore di Agricoltura, Portici, Italy.
Tepper, J. G. O., Norwood, South Australia.
Theobald, Frederick V., Wye Court, Wye, Kent, England.
Thompson, Rev. Edward H., Franklin, Tasmania.
Tryon, H., Queensland Museum, Brisbane, Queensland, Australia.
Urich, F. W., Victoria Institute, Port of Spain, Trinidad, West Indies.
Vermorel, V., Station Vitícole, Villefranche, Rhone, France.

Plate I (Frontispiece)

American Association of Economic Entomologists

Baltimore, Md., Dec. 28, 1908

EXPLANATION OF PLATE I (FRONTISPIECE)

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OF

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VOL. 2 FEBRUARY, 1909 No. 1

Proceedings of the Twenty-first Annual Meeting of the American Association of Economic Entomologists

The twenty-first annual meeting of the American Association of Economic Entomologists was held at the Eastern Female High School, Baltimore, Maryland, December 28 and 29, 1908.

Part I of this report contains the business proceedings, while the addresses, papers and discussions will be found in Part II.

PART I

The meeting was called to order by President S. A. Forbes at 10 a. m. on Friday, December 28. The attendance was larger than at any previous meeting of the Association and averaged over 100 at each session. The following members were present:

C. N. Ainslie, Washington, D. C.; George G. Ainslie, Clemson College, S. C.; H. S. Barber, Washington, D. C.; G. M. Bentley, Knoxville, Tenn.; R. W. Braucher, Washington, D. C.; W. E. Britton, New Haven, Conn.; Fred E. Brooks, Morgantown, W. Va.; Lawrence Bruner, Lincoln, Neb.; A. F. Burgess, Washington, D. C.; August Busck, Washington, D. C.; J. H. Comstock, Ithaca, N. Y.; Mel. T. Cook, Newark, Del.; R. A. Cooley, Bozeman, Mont.; E. C. Cotton, Knoxville, Tenn.; F. D. Couden, Washington, D. C.; J. C. Crawford, Washington, D. C.; C. R. Crosby, Ithaca, N. Y.; R. P. Currie, Washington, D. C.; E. P. Felt, Albany, N. Y.; H. T. Fernald, Amherst, Mass.; W. F. Fiske, Washington, D. C.; S. A. Forbes, Urbana, Ill.; H. L. Frost, Arlington, Mass.; A. B. Gahan, College Park, Md.; H. Garman, Lexington, Ky.; B. N. Gates, Washington, D. C.; A. A. Girault, Urbana, Ill.; W. H. Goodwin, Wooster, Ohio; H. A. Gossard, Wooster, Ohio; A. G. Hammar, Washington, D. C.; Paul Hayhurst, Boston, Mass.; Otto Heidemann, Washington, D. C.; W. E. Hinds, Auburn, Ala.; J. S. Hine, Columbus, Ohio; E. F. Hitchings, Augusta, Me.; H. E. Hodgkiss, Geneva, N. Y.; C. E. Hood, Dallas, Texas; C. W. Hooker,

Amherst, Mass.; W. A. Hooker, Washington, D. C.; A. D. Hopkins, Washington, D. C.; C. O. Houghton, Newark, Del.; L. O. Howard, Washington, D. C.; W. D. Hunter, Washington, D. C.; E. L. Jenne, Washington, D. C.; P. R. Jones, Washington, D. C.; E. O. G. Kelly, Washington, D. C.; Frederick Knab, Washington, D. C.; E. J. Kraus, Washington, D. C.; C. L. Marlatt, Washington, D. C.; Herbert Osborn, Columbus, Ohio; P. J. Parrott, Geneva, N. Y.; Edith M. Patch, Orono, Me.; L. M. Peairs, College Park, Md.; R. H. Pettit, Agricultural College, Mich.; E. F. Phillips, Washington, D. C.; J. L. Phillips, Blacksburg, Va.; W. D. Pierce, Washington, D. C.; C. H. Popenoe, Washington, D. C.; A. L. Quaintance, Washington, D. C.; J. L. Randall, California, Pa.; W. A. Riley, Ithaca, N. Y.; A. G. Ruggles, St. Anthony Park, Minn.; W. E. Rumsey, Morgantown, W. Va.; H. M. Russell, Washington, D. C.; J. G. Sanders, Washington, D. C.; E. D. Sanderson, Durham, N. H.; E. R. Sasscer, Washington, D. C.; A. F. Satterthwait, Harrisburg, Pa.; E. A. Schwarz, Washington, D. C.; W. M. Scott, Washington, D. C.; G. D. Shafer, East Lansing, Mich.; N. E. Shaw, Columbus, Ohio; Franklin Sherman, Jr., Raleigh, N. C.; Henry Skinner, Philadelphia, Pa.; M. V. Slingerland, Ithaca, N. Y.; H. S. Smith, Washington, D. C.; J. B. Smith, New Brunswick, N. J.; R. I. Smith, West Raleigh, N. C.; A. E. Stene, Kingston, R. I.; H. E. Summers, Ames, Iowa; T. B. Symons, College Park, Md.; E. P. Taylor, Mountain Grove, Mo.; E. S. G. Titus, Logan, Utah; C. H. T. Townsend, Washington, D. C.; R. A. Vickery, Washington, D. C.; H. L. Viereck, Detroit, Mich.; F. L. Washburn, St. Anthony Park, Minn.; J. L. Webb, Washington, D. C.; F. M. Webster, Washington, D. C.; R. L. Webster, Ames, Iowa; W. M. Wheeler, Boston, Mass.; H. F. Wilson, Washington, D. C.; H. P. Wood, Dallas, Texas; and E. L. Worsham, Atlanta, Ga.

Among the visitors were noted the following:

J. C. Bradley, Ithaca, N. Y.; B. M. Chatterjee, Ithaca, N. Y.; S. C. Clapp, Raleigh, N. C.; Mrs. Anna B. Comstock, Ithaca, N. Y.; W. S. Fisher, Harrisburg, Pa.; P. H. Hertzog, Lewisburg, Pa.; John D. Evans, Trenton, Ontario; Charles W. Johnson, Boston, Mass.; Z. P. Metcalf, Raleigh, N. C.; Aven Nelson, Laramie, Wyo.; W. C. O'Kane, Columbus, Ohio; H. T. Osborn, Columbus, Ohio; Mrs. H. S. Smith, Washington, D. C.; V. L. Wildermuth, Columbus, Ohio, and J. F. Zimmer, Columbus, Ohio.

The report of the Secretary was read as follows:

REPORT OF THE SECRETARY

The year just closing has been a prosperous one for this Association; the only sad feature having been our loss by death of five members. While the work and personality of each of these former members was held in high esteem by the members of the Association, and will undoubtedly be given proper attention by the Committee on Resolutions at this meeting, it seems but fitting to make special mention of our great loss in the death of Dr. James Fletcher, Government Entomologist of the Dominion of Canada, who was one of the prime movers in forming this Association. His interest in our organization never wavered and his words of good cheer and encouragement, especially to the young men who were just beginning their career

in entomology, will never be forgotten by any who had the privilege of his acquaintance.

Twenty-three associate and three foreign members were elected at the last annual meeting. One active and four associate members were dropped from the roll at that meeting and these with one active and two associate members that have resigned and three active and two associate members that have died, leave the total membership 252, a net gain for the year of 13.

In accordance with a resolution passed at the last annual meeting application blanks for membership have been printed. Twenty-seven applications for membership have been received by the secretary and two recommendations for foreign membership.

By direction of the Association the Secretary compiled a complete list of the accepted common names of insects, which was published in the JOURNAL and separates were sent to a list of nearly 700, including members of this Association, the Entomological Society of America and the Agricultural Press.

The correspondence during the year has increased rapidly and the work required in connection with the JOURNAL has taken much time.

An arrangement was made with the officers of the American Association of Horticultural Inspectors to have the meeting of that association held during the week that our meeting is in session. This should be of great advantage to all concerned.

FINANCIAL STATEMENT

Balance on hand, December 27, 1907			$50.12
By amount received for dues, 1908			138.50
To printing programs, 1907	$15.50		
letter-heads and envelopes	9.00		
membership application blanks	2.50		
constitution and notices	11.25		
programs, 1908	5.70		
Typewriting annual report and copies	9.00		
Copy and carbon paper	2.00		
Express on manuscript	.50		
Telegram	.35		
Postage	32.50		
Seven hundred (700) reprints common names of insects	6.90		
Committee on Nomenclature	1.85	$97.05	
Balance in treasury	91.57		
	$188.62		$188.62

The balance in the treasury which has accumulated during the past two years has been due to the fact that no stenographer has been secured to report the meetings, as was authorized by the Association. Two reasons have been responsible for this, viz., insufficient funds and inability to secure a satisfactory stenographer at the points where the meetings were held. Provision has been made for reporting the meeting this year and the expenditures next year will probably nearly equal the receipts.

Respectfully submitted,

A. F. BURGESS, *Secretary.*

By vote of the Association the report was accepted and the financial statement referred to the Auditing Committee for a later report.

The Secretary requested that some action be taken by the Association concerning the fund in the treasury; whether it should be

drawn upon for committee or similar work or held intact with the possible view of taking over the JOURNAL OF ECONOMIC ENTOMOLOGY.

He then read the list of applications for membership which were referred to the Committee on Membership.

The report of the Committee on Constitution was presented by Mr. J. B. Smith, who stated that the constitution had been revised and that copies had been mailed to the members so that action could be taken at the meeting. He explained that the principal changes were in more carefully defining the classes of membership and method of electing new members.

The Constitution as adopted follows and a summary of the discussion is added:

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

CONSTITUTION

ARTICLE I

Name and Objects

SECTION 1. This association shall be known as the American Association of Economic Entomologists.

SECT. 2. Its objects shall be: (1) To discuss new discoveries, to exchange experiences, and to carefully consider the best methods of work in economic entomology; (2) to give opportunity to individual workers of announcing proposed investigations so as to bring out suggestions and avoid unnecessary duplication of work; (3) to suggest, when possible, certain lines of investigation upon subjects of general interest; (4) to promote the study and advance the science of entomology.

ARTICLE II

Membership

SECTION 1. The membership shall be confined to workers in economic entomology. All economic entomologists employed by the General or State governments or by the State experiment stations, or by any agricultural or horticultural association, and all teachers of economic entomology in educational institutions and other persons engaged in practical work in economic entomology may become members.

SECT. 2. The classes of membership shall be active, associate and foreign. Active membership shall be conferred only on persons who have been trained in entomological work and whose practical experience or published papers have evidenced their ability to conduct original investigations in economic entomology.

SECT. 3. Associate membership may be conferred on persons who have done general or practical work in entomology and who have by published papers or otherwise, given evidence of their attainments in such work.

SECT. 4. Foreign membership shall be honorary and shall apply only to members residing outside of the United States and Canada.

SECT. 5. Associate and foreign members shall not be entitled to hold office or to vote.

SECT. 6. Membership, other than foreign membership, may be conferred at any regular meeting by a two-thirds vote of the members present upon recommendation of the committee on membership, after a regular application endorsed by two active members has been filed with the Secretary.

SECT. 7. Foreign members may be proposed in writing by any active member and their names shall be acted upon by the committee on membership and the Association as in the case of other members.

ARTICLE III

Officers

SECTION 1. The officers shall consist of a president, two vice-presidents, who shall be elected annually, and a secretary who shall be elected for a term of three years, who shall perform the duties customarily incumbent upon their respective offices and as defined in the by-laws. The above officers shall act as an executive committee and shall pass on any urgent matters that cannot be deferred until the annual meeting. The president shall not hold office for two consecutive terms. Immediately after election he shall appoint a committee on membership, consisting of three members, who shall serve during his term of office, and who shall carefully examine the membership roll and the applications for membership and report its recommendations to the association for action at a regular meeting.

ARTICLE IV

Annual Meeting—Quorum

SECTION 1. The annual meeting shall be held at such time and place as may be decided upon by the association at the previous annual meeting and special meetings may be called by order of the executive committee. Twenty members shall constitute a quorum for the transaction of business.

ARTICLE V

Amendments

SECTION 1. All proposed alterations or amendments to this constitution shall be referred to a committee of three at any regular meeting, and after a report from such committee, may be adopted by a two-thirds vote of the members present; *Provided*, That a written notice of the proposed amendment has been sent to every active member of the association at least one month prior to the date of action.

BY-LAWS

ARTICLE I

Of Members

SECTION 1. The classes of members are defined in the constitution as are their rights to vote or hold office. Members of all kinds have equal privi-

leges as to presentation of papers and in scientific discussions at the regular meetings, and may, by permission of the presiding officer, speak on business questions before the association.

SECT. 2. All members in good standing have equal rights to the publications of the association or to any publications controlled or distributed by the association.

ARTICLE II

Of Officers and Their Duties

SECTION 1. It shall be the duty of the president, in addition to the ordinary duties of the presiding officer, to prepare an address, to be delivered at the annual meeting over which he presides. He shall also appoint the necessary committees at the first session of the annual meeting.

SECT. 2. It shall be the duty of the secretary to make the necessary arrangements for the meetings of the association and keep a record of the proceedings for publication, to provide the necessary stationery and attend to the general correspondence. He shall collect moneys due, pay all bills incurred by the association, submit a report at each annual meeting, and perform such other duties as may be delegated to him.

SECT. 3. All officers and standing committees unless otherwise provided for shall be elected by ballot after recommendations have been made by a nominating committee.

ARTICLE III

Dues

SECTION 1. The annual dues of active members shall be One ($1.00) dollar, and the dues of associate members Fifty (50c) cents, which shall be payable in advance. No dues shall be payable from foreign members.

ARTICLE IV

Of Meetings

SECTION 1. Notice of the time and place of meetings shall be sent for publication to all American entomological periodicals. The proceedings shall be published as decided by the association.

SECT. 2. Special meetings shall be called as provided for in the constitution, and notice of such meetings shall be given by the secretary by mailing to each active member a formal notification of the time and place of the meeting at least two weeks before the date fixed in the notice. The notice shall state the reason for such meeting, and shall specify the business to be transacted, and no other business shall be transacted.

SECT. 3. The order of business at regular meetings shall be, at the first session:

1. Calling the meeting to order by the president.
2. Reports of officers.
3. Reports of committees.
4. Appointment of temporary committees.
5. Written business communications.
6. Verbal business communications.
7. New business.

8. Annual address of the president.
9. Program of papers and discussions.
10. Adjournment.

At the following session:

1. Discussion of the president's address.
2. Program of papers and discussions.

At the following sessions:

1. Program of papers and discussions.

Business can only be introduced at these sessions by vote of the association.

At the last regular session:

1. Program of papers and discussions.
2. Reports of appointed committees.
3. Miscellaneous business.
4. Election of officers.
5. Fixing time and place of next meeting.
6. Adjournment.

ARTICLE V

Amendments to By-Laws

SECTION 1. Changes in these by-laws may be made by a two-thirds vote at any regular meeting; *Provided*, Notice in writing of the proposed amendment be sent to every active member at least two weeks before the date of the meeting, at which it can come up for consideration.

Mr. Hopkins stated that he thought it undesirable to place the word "American" before the name of the Association, and was in favor of making the foreign members active members rather than to change the name of the Association.

Mr. J. B. Smith explained that the reason for placing "American" before the name of the Association was that it seemed absurd to have a class of foreign members unless the Association itself was limited to some specific area or country. Some time ago when certificates of membership were authorized to be given to foreign members it was necessary to designate the home of the Association in some way, and the committee that prepared the certificates took the liberty of placing the word "American" in them for that purpose. Our foreign members are honorary members and are elected because this Association wishes to recognize their standing as economic entomologists. Most of these men would not apply for active membership, so that they would never come into correspondence with us directly. They have little opportunity of meeting with us, but in case they do they have all the privileges of active members. We cannot reasonably ask members which we have elected in this way to pay dues but this would have to be done if they were made active members. It would be

necessary to change the whole tenor of the constitution if a change in the classes of membership was made.

A motion to strike out the word "American" in the title of the Association was lost.

The constitution and by-laws were then taken up section by section and passed with a few minor changes. In the by-laws under order of business for the first session the time for the presentation of the presidential address was changed so that it will follow the routine business.

By vote of the Association the constitution and by-laws were then adopted to take effect January 1, 1909, and the Secretary was authorized to entitle the various articles and sections of the constitution.

The Report of the Committee on National Control of Introduced Insect Pests, by Mr. Wilmon Newell, was read by the Secretary, as follows:

REPORT OF THE JOINT COMMITTEE ON LEGISLATION

To the Association of Economic Entomologists:

At the 18th Annual Meeting of this Association your correspondent was appointed to represent this body upon a Joint Legislative Committee, to be composed of one member from each the Association of Official Horticultural Inspectors, American Association of Nurserymen and the Association of Economic Entomologists.

At the 19th Annual Meeting, held at Chicago December 27 and 28, 1907, resolutions which had been agreed upon by the representatives of all three of these organizations were presented and adopted, and your correspondent continued as a member of the Joint Committee. The resolutions adopted by the Association at the Chicago meeting are appended hereto, labelled "Exhibit A." (They were published in the JOURNAL OF ECONOMIC ENTOMOLOGY, Feb., 1908, 1: 3–4.)

The same resolutions were approved by the Association of Official Horticultural Inspectors at Chicago and it then remained for the American Association of Nurserymen to take action on them at its meeting held at Milwaukee on June 10, 1908.

The member of the Joint Committee for the Association of Nurserymen, Mr. Orlando Harrison, made an extended canvass of the nurserymen early in 1908 to sound their views upon legislation looking to a uniform national inspection law and suitable inspection of imported nursery stock. The full report of Mr. Harrison to the American Association of Nurserymen is attached hereto, labelled "Exhibit B." (It was published in the JOURNAL OF ECONOMIC ENTOMOLOGY, Aug., 1908, 1: 270–73), and it was unanimously adopted by that organization. Briefly stated, the Association of Nurserymen refused to entertain any further consideration of a national inspection law or to endorse any further efforts towards securing one. The Association did, however, endorse thorough inspection of imported nursery stock.

In view of this attitude of the nurserymen towards a uniform inspection law, your representative would respectfully recommend that the Association

of Economic Entomologists waste no more time in trying to secure legislation of this character, unless it be requested by organizations representing fruit growers rather than nurserymen. It may be suggested, however, that this Association tender its support to the American Association of Nurserymen in securing any proper legislation intended to prevent additional importations of insect pests and looking to the control or eradication of such pests by the national government when unwittingly introduced.

Your correspondent is a firm believer in the doctrine, advocated years ago by several leading entomologists, that the duty of the professional entomologist ceases when he has called attention to any impending danger or has indicated in a conservative manner what legislation is needed to meet an existing condition. It is not his place, nor the place of this Association, to secure the passage of laws for people who do not want them.

Your correspondent further recommends and asks that the member of the Joint Committee on Legislation be discharged.

Respectfully submitted,

WILMON NEWELL.
Member Joint Committee.

Baton Rouge, La., December 21, 1908.

By vote of the Association the report was accepted and the recommendations adopted.

The report of the committee appointed to attend the Annual Meeting of the American Association of Nurserymen was presented by Mr. T. B. Symons.

REPORT OF THE COMMITTEE APPOINTED TO ATTEND THE MEETING OF THE AMERICAN ASSOCIATION OF NURSERYMEN

Mr. President:

Your committee begs leave to submit the following report: The Chairman, Dr. S. A. Forbes, being unable to attend the meeting of the Nurserymen's Association, the committee was represented by the other members, Messrs. Burgess and Symons.

A copy of the report of Mr. Orlando Harrison, Chairman of the Joint Committee on Legislation, consisting of representatives of nurserymen, entomologists and inspectors, which was submitted to the Nurserymen's Association, together with other resolutions passed by the Association bearing on legislation, was published in the fourth number of the JOURNAL OF ECONOMIC ENTOMOLOGY[1], which no doubt most of the members of this Association have seen. If desired, I would be glad to read this report and resolutions. Briefly, it may be stated that no definite action was taken by the Nurserymen's Association save the passing of a resolution authorizing the vice-presidents in each state to use all reasonable endeavor to have any drastic legislation now in force in his state modified to conform to the laws of other states, the practical workings of which have not entailed undue hardship to the nurserymen or fruit-growers in their execution of such laws. A resolution was passed expressing their appreciation of the efforts made by the entomologists and horticultural inspectors for their coöperation toward improving the insect pest legislation.

[1] August, 1908, I:270-73.

A resolution endorsing a national law providing for the government inspection of all imports was referred to their Legislative Committee.

The members of your committee present were given an opportunity to discuss national legislation for the inspection of imported nursery stock as well as nursery stock for interstate traffic in pursuance with the action taken by this Association. Every effort was made to come to some definite arrangement for future action. It was clearly seen at this meeting, however, that the sentiments of the nurserymen as a whole were not in favor of legislation of this character at this time, but that they still desired more uniformity in the inspection laws of the several states.

Respectfully submitted,

T. B. SYMONS,
A. F. BURGESS,
Committee.

On motion it was voted that the report be accepted and the committee discharged.

The report of a committee appointed to attend the Annual Meeting of the Society for the Promotion of Agricultural Science was presented by the Secretary, as follows:

REPORT ON AFFILIATION WITH AGRICULTURAL ORGANIZATIONS

Mr. President and Members of the Association:

Last August I received a letter from Prof. Thomas F. Hunt, director of the Pennsylvania Experiment Station and who was president of the Society for the Promotion of Agricultural Science, asking that a committee of this Association be appointed to attend a conference in Washington, D. C., in November, to consider the advisability of affiliating the different societies interested in agricultural science. The letter was transmitted to Dr. S. A. Forbes, the President of this Association, who appointed Dr. J. B. Smith, Prof. Franklin Sherman, Jr., and myself as members of that committee. Professor Sherman was unable to attend the meeting, but Doctor Smith and myself were present. Nothing definite was accomplished, as the Society for the Promotion of Agricultural Science had no definite plan to discuss. Some of those present were in favor of forming a national society for the advancement of agricultural science by using the Society for the Promotion of Agricultural Science as a basis. After the other societies interested in the matter had joined this association, it was planned to form sections.

Another idea was to have some simple form of affiliation so that meetings could be carried on during the general sessions without serious conflicts in the program.

Several days after this meeting I had the following correspondence with Dr. H. J. Wheeler:

MR. A. F. BURGESS, KINGSTON, R. I., November 25, 1908.
Bureau of Entomology,
U. S. Dept. of Agr., Washington, D. C.

Dear Sir: As a member of committees representing two organizations which have under consideration the desirability of affiliating various scientific societies dealing with applied science in its relation to agriculture, I write to

say that it has been proposed that an attempt be made to secure a meeting of members of committees representing these various societies on the subject of affiliation in the near future. I should like to ask whether your committee from the Association of Economic Entomologists would be able to meet with the other committees at the close of the meetings of the American Chemical Society, the American Association for the Advancement of Science, etc., at Baltimore.

A copy of this letter is being sent to the three members of your committee.

If you have in mind any definite proposition covering a scheme of federation and involving a plan for having a common editor, with perhaps a separate body of associate editors for each branch, I should be glad to hear what you would propose.

In connection with the consideration of this matter, it would be well to take into account that we have a Society for the Promotion of Agricultural Science. It has been proposed that this be enlarged to embrace all of the various sciences and that the society then divide itself into sections corresponding closely with the American Association for the Advancement of Science, except that this organization would deal with applied science in its relation to agriculture.

It would also be well to take into consideration what disposal shall be made of the scientific work done in connection with the Adams fund in the various experiment stations.

Shall it be published in the separate organs of the several societies or in the separate organs of the joint society, or shall it be published, if possible, through the Office of Experiment Stations in Washington? Is it desirable in your opinion that there should be critical discussions of other work in connection with these papers whenever desired? In your opinion would this be possible or feasible if done in a dignified and proper way, provided the publication were done through the Office of Experiment Stations? If all of this work is to be published in the organs of such a joint society, how shall it be financed?

These are some of the important questions which you should have under consideration, and I should be glad to hear from you concerning any one or all of them, or any other points which may occur to you.

I hope that I may hear that your society will be represented at the Baltimore meeting, so that an arrangement for a joint meeting of all of the committees can be made to take place immediately upon the adjournment of the various sections that will meet at that time.

Very truly yours,

H. J. WHEELER.

WASHINGTON, D. C., November 28, 1908.

DR. H. J. WHEELER,
Kingston, R. I.

Dear Sir: Replying to your letter of the 25th inst., I will say that it would appear to me to be very desirable to hold a meeting of the committees representing the various societies at Baltimore. Personally it would be more convenient if the meeting was held on Wednesday, or at latest, on Thursday.

The annual meeting of this Association will be held on Monday and Tuesday and the matter will undoubtedly be discussed and some action taken along the line of instructing the committee as to the attitude that should be taken in the matter.

As you ask for my opinion about the proposed affiliation, I herewith submit a plan that I believe to be workable and one that will accomplish the main object in view. This is my personal view of the matter and should not be considered as expressing the sentiment of this Association.

The plan I have in mind is to affiliate the societies now existing for the advancement of agriculture. This should be done by having each society select one of its members, who should be given power to act for it, to represent the society on a joint board or council. This body should be the executive head of the affiliation and should organize by electing a president and a permanent secretary and such committees as are necessary to properly con-

duct special lines of work. The permanent secretary should be the most able scientific man that can be secured, regardless of whether he is a member of the council or not.

The council through its secretary or committees could make arrangements for meetings, have general supervision over the programs and matter for publication. In this way papers bearing on closely related subjects could be so arranged on the programs and the time of the meetings so provided for that greater benefit would be derived by the members who attend.

This arrangement would be quite simple and would preserve the identity of each society participating. I feel sure that some of the older societies which would favor a plan of this sort would strongly oppose or refuse to affiliate in a new society where they would simply become sections and their identity would be lost.

It seems to me that only papers dealing with agricultural problems of broad scope should be published in a central journal and that every endeavor should be made to have this issued by the Office of Experiment Stations or other office in the U. S. Department of Agriculture that is willing to do this work. Other papers should be published as heretofore.

Trusting that these suggestions may be of some help to your committee and feeling sure that this Association will send a committee to represent it at the Baltimore meeting, I am

Yours very truly,
A. F. BURGESS,
Secretary.

Nothing further has developed concerning the matter, but it is probable that a meeting will be held this week. It would be well for the Association to consider this matter and decide what action should be taken, so that if a committee is to attend a conference it can have some definite instructions.

President Forbes stated that this report was of an *ad interim* committeee which had been appointed as a courtesy to those interested in the matter, and that the whole proposition was now open for discussion.

Mr. Marlatt stated that he had not given the matter serious consideration, but felt that it was unwise to do anything that would affect the independence of this Association. He had observed that societies which go into a general organization and partially lose their identity are less vital than when they are independent organizations. He cited Section F of the American Association as an illustration of this condition, and suggested that the whole matter be laid upon the table.

Mr. Sanderson remarked that he agreed with what Mr. Marlatt had said in regard to losing the identity of this Association. He thought, however, that it might be an advantage to have all the agricultural associations of the country meet at the same place during one week. This meeting, if properly arranged, might be a distinct gain to agriculture in this country as well as to the associations themselves. He was in favor of having the committee continued or a committee appointed to investigate the matter.

Mr. Webster explained that he was a member of the executive

committee of the Society for the Promotion of Agricultural Science and felt that it was not the desire of the Society to have any of the agricultural societies lose their identity by participating in an affiliation. He stated that in the past, before the Entomological Society of America was formed, it was customary for all kinds of papers on entomology to be presented before this Association. Now papers relating more particularly to systematic work were presented before that society. It might be well for that society to continue to meet with the American Association for the Advancement of Science and it is possible that papers of a strictly economic character could be read before an association where botanists, chemists and other agricultural workers might secure some benefit. This would be broadening and beneficial to all economic workers.

Mr. Hopkins thought that the movement involved progressive ideas and that an affiliation which would not result in the surrender of the identity of this Association would be beneficial.

A member called attention to the fact that many would not be able to attend more than one meeting in a year and that this would mean that there would not be a large attendance if the Entomological Society of America and this Association met at different places. He was in favor of having a committee investigate the matter.

Mr. Marlatt stated that he had no desire to prevent progress in the matter, if progress is possible. He was still opposed to any loss of identity of the Association, as he considered this would be a poor policy.

A motion was made by Mr. Hopkins that a committee of three be appointed to confer with committees from other societies and report to the Association at the next meeting and that the committee now appointed present a general plan of action for the consideration of the Association before final adjournment.

After a brief discussion a vote was taken and the motion prevailed.

The President appointed the following committee: Lawrence Bruner, A. D. Hopkins and J. B. Smith.

Mr. Smith asked to be relieved from serving on the committee and A. F. Burgess was appointed in his place.

The Secretary called attention to the fact that several members had submitted titles of papers that had arrived too late to be included in the printed program.

By vote of the Association, the Secretary was instructed to interpolate these titles in the program.

Mr. Sanderson announced that arrangements had been made to have a photograph of the Association taken immediately before the opening of the afternoon session.

On motion a committee of five was appointed to draft suitable resolutions on the death of the members that had passed away since the last meeting.

The chair announced the following committees:

Membership—H. E. Summers, J. B. Smith and H. Garman.

Nominations—E. D. Sanderson, Franklin Sherman, Jr., and E. S. G. Titus.

Resolutions—E. P. Felt, F. L. Washburn and R. I. Smith.

Auditing—W. F. Fiske and W. E. Britton.

Memorial Resolutions—J. B. Smith, Henry Skinner, M. V. Slingerland, L. Bruner and R. A. Cooley.

The meeting then adjourned until 1 p. m.

The following report was submitted by the Committee on Nomenclature by Mr. Herbert Osborn:

REPORT OF THE COMMITTEE ON NOMENCLATURE

The committee believes that some general policy with reference to the use of common names applying to a number of species in a genus, and separate names for larvæ and adult stages in cases where both may be commonly known as destructive forms may be necessary, and hopes to present some recommendations by another year.

We recommend the incorporation of the names approved at this meeting in the list hitherto adopted and the publication of the complete list in the proceedings of the society, with distribution as heretofore to agricultural journals and entomological writers.

The committee desires to thank the many members who have interested themselves in this matter and have assisted by suggestions, and it is hoped that this assistance will be freely continued.

Respectfully submitted,

HERBERT OSBORN,
E. S. G. TITUS,
A. L. QUAINTANCE,
Committee.

By vote of the Association the report was accepted and the list which follows was adopted.

LIST OF COMMON NAMES ADOPTED

Alfalfa leaf-weevil.....*Phytonomus murinus* Fab.
Angular-winged katydid.....*Microcentrum retinerve* Burm.
Apple leaf-hopper.....*Empoasca mali* LeB.
Apple leaf trumpet miner.....*Tischeria malifoliella* Clem.
Apple twig-beetle.....*Stephanoderus hispidulus* Lec.
Barnacle wax-scale.....*Ceroplastes cirripediformis* Comst.
Bean leaf-beetle.....*Ceratoma trifurcata* Forst.
Bean leaf-roller.....*Eudamus proteus* Linn.
Beet leaf-hopper.....*Eutettix tenella* Bak.
Blackhead cranberry worm.....*Eudemis vacciniana* Pack.

Black peach aphis.....*Aphis persicæ-niger* Er. Sm.
Cabbage webworm.....*Hellula undalis* Fab.
Cactus scale.....*Diaspis echinocacti* (Bouche).
Chain spotted geometer.....*Cingilia catenaria* Drury.
Cherry aphis.....*Myzus cerasi* Linn.
Cherry fruit maggot.....*Rhagoletis cingulata* Loew.
Cigar case-bearer.....*Coleophora fletcherella* Fernald.
Citrus rust mite.....*Eriophyes oleivorus* Ashm.
Citrus white-fly.....*Aleurodes citri*, R. & H.
Clover seed chalcid fly.....*Bruchophagus funebris* How.
Cowpea weevil.....*Bruchus chinensis* Linn.
Cranberry fruit-worm.....*Mincola vaccinii* Riley.
Currant aphis.....*Myzus ribis* Linn.
Currant fruit-fly.....*Epochra canadensis* Loew.
Eight-spotted forester.....*Alypia octomaculata* Fab.
Euonymus scale.....*Chionaspis euonymi* Comst.
European elm scale.....*Gossyparia spuria* Modeer.
European fruit-scale.....*Aspidiotus ostreæformis* Curt.
European grain aphis.....*Siphocoryne avenæ* Fab.
Eye-spotted bud-moth.....*Tmetocera ocellana* Schiff.
Fern scale.....*Hemichionaspis aspidistræ* (Sign).
Flat-headed apple-tree borer.....*Chrysobothris femorata* Fab.
Florida red scale.....*Chrysomphalus ficus* Ashm. (*aonidum*).
Florida wax-scale.....*Ceroplastes floridensis* Comst.
Fuller's rose-beetle.....*Aramigus fulleri* Horn.
Gloomy scale.....*Chrysomphalus tenebricosus* (Comst).
Glover's scale.....*Lepidosaphes gloveri* Pack.
Gooseberry fruit-worm.....*Zophodia grossulariæ* Pack.
Grape berry moth.....*Polychrosis viteana* Clem.
Grape curculio.....*Craponius inæqualis* Say.
Grape leaf-hopper.....*Typhlocyba comes* Say.
Grape plume moth.....*Oxyptilus periscelidactylus* Fitch.
Grape root-borer.....*Memythrus polistiformis* Harr.
Grape root-worm.....*Fidia viticida* Walsh.
Grape sawfly.....*Blennocampa pygmaea* Say.
Grape scale.....*Aspidiotus uvæ* Comst.
Grapevine aphis.....*Siphonophora viticola* Thos.
Greedy scale.....*Aspidiotus rapax* Comst. (*camelliæ*)
Greenhouse white-fly.....*Aleurodes vaporariorum* West.
Green June beetle.....*Allorhina nitida* Linn.
Hemispherical scale.....*Saissetia hemisphærica* Targ.
Howard's scale.....*Aspidiotus howardi* Ckll.
Imported cabbage worm.....*Pontia rapæ* Sch.
Imported currant worm.....*Pteronus ribesii* Scop.
Io moth.....*Automeris io* Fab.
Lesser apple worm.....*Enarmonia prunivora* Walsh.
Lime-tree winter moth.....*Erannis tiliaria* Harr.
Lubber grasshopper.....*Brachystola magna* Gir.
Magnolia scale.....*Neolecanium cornuparvum* Thro.
Negro bug.....*Corimalæna pulicaria* Germ.

Orange dog.....*Papilio thoas* Linn.
Orange maggot.....*Trypeta ludens* Loew.
Oriental moth.....*Cnidocampa flavescens* Walk.
Peach bark-beetle.....*Phlocophthorus liminaris* Harris.
Peach twig-moth.....*Anarsia lineotella* Zell.
Pear-leaf blister-mite.....*Eriophyes pyri* Pagnst.
Pear thrips.....*Euthrips pyri* Daniel.
Potato-tuber worm.....*Phthorimæa operculella* Zeller.
Purple scale.....*Lepidosaphes beckii* Newm.
Quince curculio.....*Conotrachelus crataegi* Walsh.
Raspberry cane-borer.....*Oberea bimaculata* Oliv.
Raspberry root-borer.....*Bembecia marginata* Harr.
Red-humped apple caterpillar.....*Schizura concinna* S. & A.
Round-headed apple-tree borer.....*Saperda candida* Fab.
Sinuate pear-tree borer.....*Agrilus sinuatus* Oliv.
Snowy tree cricket.....*Oecanthus niveus* DeG.
Soft scale.....*Coccus hesperidum* Linn.
Southern cabbage worm.....*Pontia protodice* Boisd.
Squash lady beetle.....*Epilachna borealis* Fab.
Strawberry crown moth.....*Aegeria rutilans* Hy Edw.
Striped cucumber beetle.....*Diabrotica vittata* Fab.
Sugar-cane beetle.....*Ligyrus rugiceps* Lec.
Tent caterpillar.....*Malacosoma americana* Fab.
Terrapin scale.....*Eulecanium nigrofasciatum* Perg.
Tobacco flea-beetle.....*Epitrix parvula* Fab.
Two-striped walking stick.....*Anisomorpha buprestoides* Stahl.
Walnut scale.....*Aspidiotus juglans-regiæ* Comst.
Woolly apple aphis.....*Schizoneura lanigera* Hausm.
Yellow-head cranberry worm.....*Acleris minuta* Rob.

Mr. Hopkins presented a list of common names of beetles, which he stated he had recently used in connection with a publication that had just gone to press and stated that he would like to present the list to the Association for adoption if there was no objection.

Mr. Sanderson stated that he had no objection to the names, but thought that they should be referred to the committee.

By vote of the Association the list was referred to the Committee on Nomenclature, with instructions to report on the matter before the close of the meeting.

The President called the attention of the Association to the fact that there was a vacancy on the Council, owing to the death of Dr. James Fletcher.

It was voted to elect one member to fill this position and Mr. Herbert Osborn was chosen to fill the unexpired term.

At the afternoon session Tuesday the following report was presented by the Committee on Insecticides, by Mr. E. D. Sanderson:

REPORT OF THE COMMITTEE ON INSECTICIDES

Your committee has had requests from several manufacturers for testing new insecticides, mostly scale remedies, most of which seem to have had no practical tests in the orchard. After consideration of the merits of those submitted, your committee deemed it best to adopt the policy of advising manufacturers that after they had made practical tests of their remedies in the field and furnished the committee with statements of the results, we would then investigate the results secured, and if the insecticides then seemed to have sufficient promise that we would then try and arrange coöperative tests. Manufacturers have been so advised and as yet no new insecticides have arisen which seem to your committee to need coöperative testing.

Your committee wishes to reaffirm the report of previous committees that a general testing of proprietary insecticides by individual entomologists is an unnecessary duplication of effort and that requests from manufacturers for such tests be referred to the committee for action. We would also urge that any new insecticides whose promise seems to warrant further testing be suggested to the committee by members of the Association so that coöperative testing may be arranged.

Your committee found that an amendment to the Pure Food and Drug Law to cover insecticides and fungicides was impractical and was instrumental in having introduced Senate Bill 6515 and H. R. Bill 21318, providing for the inspection of insecticides and fungicides by the federal government. A conference with the manufacturers was held in New York on June 16 and various amendments were proposed and the measure as amended was endorsed. An executive committee composed of two manufacturers, two entomologists, and one agricultural chemist was appointed, who have collected funds to provide for pushing the measure and are doing everything possible to organize the support of this measure before Congress. Your committee finds that this measure has the hearty support of manufacturers and consumers and urges its support upon the members of this Association.

Respectfully submitted,

E. D. SANDERSON,
E. P. FELT,
H. E. SUMMERS,
R. I. SMITH,
Committee.

In discussing this report Mr. Slingerland asked if it was advisable to turn new insecticides back to the manufacturers to be tested by them.

In reply Mr. Sanderson stated that some new insecticides had been referred to the committee with a request that they be tested. It seemed a waste of time to test these materials unless it was known whether they were of some value. The better plan seemed to be to have the manufacturer place such insecticides in the hands of some

practical fruit grower for test, in order to ascertain whether they had any merit, before asking the entomologists to devote a large amount of time to testing materials, many of which would prove worthless.

Mr. Slingerland stated that he thought this was the right method to follow and that he knew of one case where a manufacturer was having an insecticide tested, at the expense of the company, before putting it on sale.

By vote of the Association the report was accepted and the recommendations adopted.

The Committee on Nomenclature presented the following report concerning the list of common names of insects submitted by Mr. Hopkins:

SPECIAL REPORT OF THE COMMITTEE ON NOMENCLATURE

Concerning the list of names submitted by Professor Hopkins your committee would recommend that the author's use of the names be commended and that their use by our members be advised, but that considering the fact that they have not been open to examination by the society or discussion by the committee, their final adoption and incorporation in the list approved for universal use be deferred.

Respectfully submitted,
HERBERT OSBORN,
E. G. TITUS,
A. L. QUAINTANCE,
Committee.

On motion the report was adopted as read.

The Auditing Committee presented the following report:

REPORT OF THE AUDITING COMMITTEE

We have examined the financial accounts of the Secretary and find them correct.

W. F. FISKE.
W. E. BRITTON.

By vote of the Association the report was accepted.

The report of the Committee on Membership was next presented, by Mr. H. E. Summers.

REPORT OF THE COMMITTEE ON MEMBERSHIP

The committee has followed the policy of being rather strict in the interpretation of the rule regarding the admission of active members, and, on the other hand, of being as liberal as the rules seemed to allow in admitting to associate membership, with the idea of encouraging those who certainly have the intention of pursuing economic entomology as a profession, practically the only requirement for associate membership being that the candidate be vouched for by two active members and that he be occupying some

position in economic entomology. For two years past, the committee has failed to look over in advance of the meeting the list of associate members with any care to decide upon those that should be raised to active membership, the rule requiring that the committee should do this. The list presented this year, therefore, is especially long. It is a difficult thing, in many cases, to find out exactly the comparative merits in a long list that needs to be examined, and injustice may result in some instances.

The following recommendations are herewith submitted:

For foreign members:

Prof. Carlos E. Porter, Directeur de la "*Revista Chilena de Historia Natural*," Casilla 2352, Santiago, Chile.

Mr. Charles S. Reed, official entomologist, Mendoza, Argentine Republic.

For active member:

Dr. W. M. Wheeler, Bussey Institution, Forest Hills, Boston, Mass.

For transfer from associate to active membership:

C. N. Ainslie, Washington, D. C.
Fred E. Brooks, Morgantown, W. Va.
E. C. Cotton, Knoxville, Tenn.
John A. Grossbeck, New Brunswick, N. J.
T. J. Headlee, Manhattan, Kansas.
Glen W. Herrick, College Station, Texas.
G. W. Kirkaldy, Honolulu, H. T.
A. C. Morgan, Washington, D. C.
Dudley Moulton, Washington, D. C.
Edith M. Patch, Orono, Me.
W. A. Riley, Ithaca, N. Y.
A. G. Ruggles, St. Anthony Park, Minn.
C. H. T. Townsend, Washington, D. C.
R. L. Webster, Ames, Iowa.
R. S. Woglum, Washington, D. C.
E. L. Worsham, Atlanta, Ga.

For associate members:

George G. Ainslie, Clemson College, S. C.
W. W. Chase, Atlanta, Ga.
C. R. Crosby, Ithaca, N. Y.
D. T. Fullaway, Honolulu, H. T.
A. G. Hammar, Washington, D. C.
Paul Hayhurst, Bussey Institution, Forest Hills, Boston, Mass.
C. E. Hood, Dallas, Texas.
C. W. Hooker, Amherst, Mass.
J. R. Horton, Logan, Utah.
J. A. Hyslop, Washington, D. C.
E. L. Jenne, Washington, D. C.
A. H. Jennings, Ancon, Canal Zone, Panama.
E. O. G. Kelly, Washington, D. C.
Frederick Knab, Washington, D. C.
E. J. Kraus, Washington, D. C.
A. C. Lewis, Atlanta, Ga.

W. R. McConnell, State College, Pa.
A. H. McCray, Columbus, Ohio.
L. M. Peairs, College Park, Md.
C. H. Popenoe, Washington, D. C.
W. J. Price, Jr., Blacksburg, Va.
W. V. Reed, Atlanta, Ga.
D. M. Rogers, Boston, Mass.
A. F. Satterthwait, Harrisburg, Pa.
G. D. Shafer, East Lansing, Mich.
N. E. Shaw, Columbus, Ohio.
C. P. Smith, Logan, Utah.
L. M. Smith, Carbondale, Ill.
A. E. Stene, Kingston, R. I.
J. C. Stiles, Blacksburg, Va.
F. W. Terry, Honolulu, H. T.
W. F. Turner, Auburn, Ala.
T. D. Urbahns, Washington, D. C.
H. F. Wilson, Washington, D. C.
H. P. Wood, Dallas, Texas.
M. A. Yothers, East Lansing, Mich.

Respectfully submitted,
H. E. SUMMERS,
J. B. SMITH,
H. GARMAN,
Committee.

On motion the report of the committee was accepted and the recommendations adopted by the Association.

REPORT OF THE COMMITTEE ON MEMORIAL RESOLUTIONS.

The Committee on Memorial Resolutions submitted the following report:

WHEREAS, since the last meeting of this Association death has removed from our midst,

DR. WILLIAM H. ASHMEAD,
MR. ALEXANDER CRAW,
DR. JAMES FLETCHER,
PROF. WILLIS G. JOHNSON, and
PROF. FRANCIS H. SNOW, and

WHEREAS, in these deaths this Association has lost valuable members and we, their associates, have lost friends and fellow-workers, it is eminently fitting that we place upon our records an expression of our appreciation of the individual regard for the scientific man and of sorrow for the loss.

Dr. WILLIAM H. ASHMEAD was long, if not very closely, associated with us and was one of the pioneers in economic entomology in the South, and though in later years better known as a systematist, he always retained an interest in our meetings and purposes. His work among the parasitic Hymenoptera was of the utmost importance to the practical worker, and of high scientific value: he was indefatigable as a student and there is no doubt that his devotion to his work shortened his days. As a man, the best that can be said of him is that he was a gentleman: courteous always, frank, obliging, and scrupulously exact in his dealings with his fellows. His death is a loss to Entomology from all points of view.

ALEXANDER CRAW was associated with us for many years, but more in spirit and purpose than in bodily presence. He carried on a most important economic work on the Pacific coast and California fruit growers, especially, owe him a debt of gratitude for the entomological work done by him. He was the first quarantine officer for insect inspection work and his efforts to keep out injurious species were untiring and markedly successful. Persistent and painstaking in all his undertakings he gained the confidence and respect of the community in which he worked, and did much to further economic entomology.

Dr. JAMES FLETCHER was one of the men whose efforts dignified work in economic entomology when such work was little regarded and less appreciated. He was one of those who was active in organizing this Association and worked tirelessly to secure its success: he thoroughly believed in the value and usefulness of our work, and by his persuasive speech and personal magnetism he impressed his conviction upon others and secured results that no one less energetic than he could have obtained: he made friends of his constituents and made them believe in him, being careful at all times to justify their belief: he was a friend and helper to all who were interested in natural history and was active in societies and other organizations dealing with such and related subjects: no one ever applied to him in vain for anything that he could give and the amateur or student was always sure of assistance for the asking: his jolly, good-natured presence was always an incentive to better work and no meeting was dull when he joined in the discussions; although his work was in Canada ranging from the Atlantic to the Pacific, he visited all parts of the United States, had a personal acquaintance with most of our members and was a contributor at nearly all our meetings.

In his scientific attainments he was broad and varied, his entomo-

logical work forming only a part of his interests; but economic entomology is especially indebted to him for its advancement, and economic entomologists owe him a debt of gratitude, the extent of which is as yet hardly realized.

Prof. WILLIS G. JOHNSON was a younger man, cut down in his prime, full of life and vigor, radiating vital energy, always enthusiastic and earnest in all his undertakings. His training was of the modern type and he was one of the first of the younger men to enter work in economic entomology, well equipped by teachers and by service under veterans in our science. He was also one of the first to inaugurate a vigorous campaign in the Atlantic Coast states against the San José scale, and his work in Maryland opened up original methods and impressed upon the community the necessity for concerted action. Legislation against injurious insects and control by inspection and fumigation in the East found one of its earliest and most persistent advocates in Professor Johnson and his work has served as a guide to those who followed him. For some years before his death he abandoned his work in entomology for service on a farm paper, but in this position he also did much educational work in economic entomology and always maintained his interest in our association.

Prof. FRANCIS H. SNOW, of Kansas, was an example of a long life well spent in service to the community. Modest and unassuming in manner, always quiet in his methods of work, he exercised an influence that was mighty in extent. As an educator he is affectionately remembered by several of our members, and his work for our science in the training of students is one that cannot be too highly estimated. But not only as a teacher is he to be remembered: he was an original investigator and thinker as well, and to him economic entomology owes much for his researches and practical experiments with certain diseases of insects. The institution with which he was so many years connected owes much of its development and influence to him, especially the enormous collections made on his annual trips for the last twenty years, and while he was never active in the affairs of this Association he was a member of whom we were justly proud, and whose name added to the dignity of our body.

Now, therefore, be it

Resolved, That this Association as such and its members, individually, do hereby express profound sorrow for the loss of these, our fellow-members, and appreciation for their attainments.

Resolved, further, That this minute be spread upon the records of the society and published as a part of its proceedings.

Respectfully submitted,

JOHN B. SMITH,
HENRY SKINNER,
M. V. SLINGERLAND,
LAWRENCE BRUNER,
R. A. COOLEY,
Committee.

By vote of the Association the resolutions were adopted as read.

The report of the Committee on Resolutions was presented as follows:

REPORT OF THE COMMITTEE ON RESOLUTIONS

Resolved, That the Association of Economic Entomologists hereby expresses its appreciation for the courtesies extended by the local committee on arrangements and by the Board of Education of Baltimore.

Resolved, That as an Association we urge upon Congress the importance of passing House Bill No. 21318 and Senate Bill No. 6515, which provides for regulating the standards of insecticides and fungicides entering into interstate commerce.

Resolved, That we again place on record our conviction that the control of the gypsy moth in New England is an entomological problem of the first magnitude and of great practical importance to the entire country. Furthermore, we would emphasize the necessity of the State of Massachusetts continuing with undiminished vigor the policy prosecuted so ably during the past few years.

Resolved, That this Association emphasizes most strongly the importance of insects as carriers of disease, and hereby urges its members to do all in their power to better sanitary conditions.

Resolved, That the members of this Association hereby express their thanks to A. F. Burgess for his most efficient services as Secretary during the past four years.

Respectfully submitted,

E. P. FELT.
F. L. WASHBURN.
R. I. SMITH,
Commitee.

The following amendment presented by Messrs. Washburn and Smith of the committee was added, and by vote of the Association the report was accepted as amended.

Resolved, That this Association in congratulating itself on the success of the JOURNAL OF ECONOMIC ENTOMOLOGY during the past year, hereby testifies its appreciation of the work of the Journal's Board of Editors, through whose generous efforts the success of this, its first year, has been secured.

The report of the Committee on Affiliation was presented by Mr. Hopkins, as follows:

REPORT OF THE COMMITTEE ON AFFILIATION

After considering the matter of affiliation of the different societies interested in agriculture, the committee believes that the statement which follows will serve as a basis for discussing the matter if it seems desirable to have any affiliation.

Condition

There are many societies with widely varying fields of usefulness having for their common object the general advancement of agriculture, but with at present no organized effort towards common efficiency, consequently, there is much duplication of effort, discussion, expenditures, etc.

Needs

There is special need for some form of affiliation, by which the identity of each society may be retained for its special objects, but by which the common interests and objects of all will be furthered.

Plan of Organization

Name: The Affiliated Societies for the Advancement of Agriculture.

Object: To contribute to the advancement of agriculture by promoting the common objects and interests of all scientific and other societies organized for the consideration of subjects relating to agricultural science.

Plan of Affiliation. One elected representative of each society to constitute a council for the consideration of all subjects of common interest. The council to serve as an executive head of the affiliation, with its president, permanent secretary and committees on meetings, programs and publications.

The permanent secretary should be the best man available regardless of membership on the council.

Lawrence Bruner,
A. D. Hopkins,
A. F. Burgess,
Committee.

By vote of the Association, the recommendations were adopted, and the Committee was instructed to insist upon the principles outlined when meeting with the other committees appointed to consider affiliation.

REPORT OF THE COMMITTEE ON NOMINATIONS

The report of the committee was submitted as follows:

For President, W. E. Britton, New Haven, Conn.

For First Vice-President, E. D. Ball, Logan, Utah.

For Second Vice-President, H. E. Summers, Ames, Iowa.

For Secretary, A. F. Burgess, Washington, D. C.

For Member of Committee on Nomenclature, Herbert Osborn, Columbus, Ohio.

For Member of Advisory Board of Journal, one year, Wilmon Newell, Baton Rouge, La.

For Members of Advisory Board, three years, H. T. Fernald, Amherst, Mass.; Herbert Osborn, Columbus, Ohio.

For Members of Council, S. A. Forbes, Urbana, Ill.; H. E. Summers, Ames, Iowa.

Respectfully submitted,
E. D. SANDERSON,
FRANKLIN SHERMAN, JR.,
E. S. G. TITUS,
Committee.

By vote of the Association, the Secretary was instructed to cast a ballot for the officers recommended by the Committee, and they were declared duly elected.

Mr. Sanderson called attention of the Association to the large amount of work which now devolves upon the Secretary, and stated that he thought that the expenses incurred by the Secretary in attending the annual meeting should be paid.

Mr. Britton stated that while he was heartily in favor of paying the Secretary, he believed it would be much better to pay a stated salary than to pay his expenses when attending the annual meeting.

By vote of the Association the matter of compensation of the Secretary was referred to the Executive Committee for report at the next annual meeting.

It was voted that the time and place of the next meeting be decided by the Executive Committee.

There being no further business the meeting adjourned.

PART II

The address of the President was presented at the opening session on Monday morning, as follows:

ASPECTS OF PROGRESS IN ECONOMIC ENTOMOLOGY

By S. A. FORBES, *Urbana, Ill.*

It is fifteen years since I had the honor and the privilege of presiding over the Fifth Annual Meeting of this Association at Madison, Wisconsin, and of presenting to it the annual address, and my thoughts naturally revert to the conditions of that time as a means of measuring the progress we have made. We have met some very heavy losses since 1893, in Riley, the prince of economic entomologists, and one of the great founders of our science; in Lintner, a careful, thor-

ough student, a clear, methodical writer, a correct and genial gentleman; and now in Fletcher, whose late departure has made of this society a family of mourners, each of us grieving as over a personal loss. Many others have left our little group in these fifteen years, either by the road which we all at last must travel, or drawn away from the difficult and perplexing path of economic entomology into others more inviting to them.

But serious as our loss has been, our gains, I need hardly say, have far surpassed them. I referred, I remember, in the address I have mentioned, to the time then passing as the classic period in economic entomology—the time of the beginnings of great things, when the larger features of our field were just becoming fairly outlined, when the essential methods of our work were being definitely agreed upon and brought into general use. The older method of observation, description and deductive inference—the method of Harris and Fitch and Walsh and Le Baron, and of Riley in his younger days—was yielding to the method of comprehensive survey, exact experiment, and practical verification in the field, which characterizes all our best recent work; and among the older men—self-taught entomologists most of us—were appearing a younger generation of well-trained scientists, taught, in many cases, it is true, by teachers who had themselves had no specialized training, but who taught well and thoroughly nevertheless because they were born to teach, and who had been, consequently, their own first and best-taught pupils. And now this younger generation of well-trained students, whose presence at Madison was welcomed with hopeful anticipation, is itself beginning to get a little gray at the temples and a little bald under the crown of the hat, and the country is alive with bachelors and masters of science and doctors of philosophy, a small army of whom are at work each in his special part of our general field.

Besides this great and surprising increase in the number of workers on our subject, and this very great improvement in their scientific preparation for their work, none of us who are fifteen entomological years of age can have failed to note an equally great and encouraging improvement in our methods of investigation, in our means and forms of publication, and in ways of bringing our results promptly to practical application by those in whose interest all our studies are made. Our work has become at the same time more scientific and more practical, better based in scientific principles of permanent character and wide application, and better worked out in ways to commend its results immediately to our economic constituency.

Trusting, however, to your recollection of your own observations

and experience for a sufficient review of these matters of recent history, I would like to use my present brief and rare opportunity and privilege in an endeavor to forecast the immediate future, and, judging from what we have seen and what we now see in progress, to deduce the probable next steps in the development of method in our work.

Economic entomology is an extremely complex subject, not only by reason of the number of factors which it must include, but especially because of the variability of many of these factors, and our inability to predict the course of events with certainty in our field. We study the present and the past in a practical way in order that we may predict the future. We observe, generalize, experiment and verify in order that we may be able to say to the farmer or the fruit grower, "Do thus and so in any given case, and this or that desired result will follow;" but we can rarely express our conclusions safely in so definite a form. Often the best we can fairly say is that if the weather should be wet, or dry, or neither one nor the other, as the case may be; or if it has been very wet, or very dry, for the last two or three or four years; or if the winter has been, or is to be, open or severe; if the crop in question has been preceded by some other kind of crop, or by one of the same kind; and if the insect situation was thus and so last year and the year before; if, furthermore, the land is light or heavy, high or low, well drained or wet; if it has had this or the other management or treatment during the last year or two; and if several other variable elements of the problem vary to such or such a degree, in this or the other direction—then if the operation X be performed, the result will *probably* be Y, but with what *degree* of probability it is impossible for us to say. Agriculture is itself one of the more uncertain callings, and the farmer every year bets the cost of his crop on the chances of his harvest; but the entomology of agriculture is more uncertain still, for insects liable to infest a crop are affected, directly or indirectly, obversely or inversely, by everything which affects the crop itself, and by several other things beside. How may we approximate certainty of prediction in this variable tangle of uncertainties within uncertainties in the midst of which we have to work? It is only by long-continued observation, by comprehensive survey of all related matters, by repeated and varied experiment, and by the use of *statistical methods* such as will teach us the range of variation and the character of the average in any given case. By an intelligent use of counts and estimates and averages we can often approximate certainty, where without them our uncertainty would be complete. We can say that in about such a per cent of so many trials you will get your desired

result, where otherwise we ought really to say nothing at all; and the statistical method of record and report has always the great advantage that it conveys perfectly definite information, and that it gives us a structure of fact to which the next man may safely build. It enables us to accumulate results by adding one like unit of construction to another, whereas otherwise each little structure must stand by itself for what it appears to be worth. I confidently expect to see this aid to accurate work more and more used in coming years, until a paper whose data of observation and experiment are not summed up in statistical tables or their equivalent will be as rare as the old-style paper of deductive inference to economic measures is today.

Next to the command and use of this method of statistics—a completed method ready-made to our hands, and which we have only to appropriate and adapt to our ends—I have come to look, of recent years, with eager interest to the new and still developing *methods of ecology* as an aid to our work on our larger and more difficult problems. Economic entomology is, in fact, a special division of ecology. It has to do with the relations of insects to the welfare of man. It is the science of the interactions, direct and indirect, between man on the one hand and insects on the other, in so far as these interactions affect human welfare. The welfare of man is the primary study, and entomology comes into the field only in a secondary way. Now the ecologist studies, analyzes, classifies, generalizes and interprets the relations of interaction between all organisms and their entire environment, inorganic and organic. On the side of the environment he studies all features and factors which in any way condition or affect the life of animals and plants; on the side of the organism he studies all the reactions, adaptations and immediate or final effects which are in any way traceable to the factors of the environment; and on both sides of the relation he seeks for causes, for principles, for laws, which are permanent and invariable because they are involved in the nature of things—in the nature of protoplasm on the one hand, and in that of the physical world on the other.

So regarded and so studied, ecology evidently lies at the very center of biology. Indeed, it is practically identical with biology as defined, perhaps most clearly, by that great zoölogist—that great naturalist—Brooks, of Johns Hopkins, who says in the introduction to his remarkable volume on "The Foundations of Zoölogy," that life is response to the order of nature, that biology is the study of this response—of this reaction; and that the study of the order of nature to which response is made is as well within the province of biology as a study of the living organism which responds. Upon this topic of en-

tomological response—of ecological interaction—we economic entomologists have been busy all our working lives, whether we have made precise note of the fact or not. We are indeed, whether we have meant to be or not, the leading ecologists in America today. As practical entomologists, however, our work has run, as a rule, along too narrow lines to give us an adequate view and command of the whole field; and there is now coming to our aid a group of active young ecologists who, unfettered by any responsibility for an economic result, are working out the relations of organisms to peculiarities of local situation and condition, who are searching for the causes of local distribution and abundance in the facts of interaction and adaptation, and who are tracing also the history and development of this distribution and association of species by processes as careful and as promising of fruitful result as those which have given us the geological history of the globe. All of their most general, most important results must apply in our special field; and a knowledge and appreciation of their method will lead us to study our larger problems in the large way; to treat an entomological inquiry as merely a special item in a broad investigation, which shall include, from the beginning, all the factors which can enter into it or influence it to any significant degree. It is particularly important to us that we should have clear ideas of the system of relations existing in our several districts between insects and the *organic* world at large, before civilized man appeared upon the scene, with his associate group of intrusive animals and plants; for we can only modify or disturb, often to our own disadvantage, this primitive natural order, and can never wholly replace it. The same forces which established it in the beginning are constantly at work, not perhaps to reëstablish the old order, but at least to rectify disturbances due to us and to establish finally a new order of equilibrium between the remaining remnants of the old and the intrusive elements we have introduced.

Permit me to give you a simple illustration of the application of the ecological method to the organization and discussion of the data of an economic problem; and for this purpose I will take the corn-insect problem as the one with which I am, perhaps, most familiar. From the ecological point of view a corn field is a situation—a habitat, a biotope—and its inhabitants are a biological association, or a biocœnose. The assemblage of plants and animals characteristic of it is found together in the corn field because of its special fitness for their occurrence and their maintenance there, and this assemblage has had its history of first appearance and gradual transformation. It has its important relations to surrounding situations, and to their charac-

teristic associations of plants and animals—those of the pasture, the oats field, and the like—and its relations also to associations preceding it on its own area. As a biological association the inhabitants of the corn field are variously related to each other—as competitors, as enemies, as parasites, as coöperating partners, or as mere indifferent companions, and their varying actions and interactions make up the general ecological system of this corn field situation. The leading members of this association, the kinds of organisms which may almost invariably be found together in it, are certain grasses—species of *Setaria* and *Panicum* especially; and certain smartweeds or heartweeds—species of *Polygonum*—all of which start spontaneously from the seed in very early spring; the corn plant itself—whose dominance gives its name to the association, the corn-field ant (*Lasius niger americanus*), the corn root-aphis, the corn root-worm, the white-grubs, and the ear-worm; and to these we must add two other members of the group, without which there could have been no cornfield in the beginning, and none could continue so much as a single year—that is, the horse and the man. The man, the horse, the corn plant, the smartweed, the two grasses mentioned, the ants, the aphids, the grubs, and the ear-worm are the essential members of this association; but with these, I need not say, we must often include many other occasional or less conspicuous members—the wireworms and the bill-bugs, if a pasture or meadow has preceded corn within a year or two; the cutworms and the army-worm, perhaps, in spring, and the grasshoppers in fall, if such an association is established beside it; many species of birds, most of which are, as a rule, scarcely more than accidental visitants; the moles, the ground-squirrels, and the mice, which have their more or less definite reasons for frequenting it or for residing in it.

If we analyze the relations of these various inhabitants of the field we find that three of these kinds form a coöperating partnership and that two of them form another—the man, the horse and the corn plant in one such group and the corn root-aphis and the cornfield ant in the other. The interests of the former group are in open opposition to those of all the other inhabitants of the field, so much so that this group would profit greatly by the extermination of all the rest; and its dominant agent, man, being more or less aware of this fact, he seeks, as a rule, to destroy them all as completely as he can. He fails to do so completely, notwithstanding his best endeavors, because some of his competing associates are really better adapted to the situation than the corn, the horse, and the man themselves; and, furthermore, because several of the competitors of this dominant group thrive most by the very measures which it takes in its own immediate interest. The ear-

worm would be compelled to seek its food in other and much less abundant plants, the corn root-aphis would be limited to the comparatively sapless roots of the small field weeds; the cornfield ant would have to forage mainly for its food, and the corn root-worm would seemingly perish from off our area if it were not for the contributions to their welfare made by man in the pursuit of his own ends.

Similar incidental contributions of one group to the welfare of another are seen in the relations of the weeds of the field in early spring to the first seasonal appearance of the corn root-aphis, which is dependent for its maintenance on these young weeds for as much as a month before the corn has begun to grow. This seasonal succession of plants in the cornfield is thus a necessary condition to the existence of the aphis there. On the other hand the corn root-worm could not exist except for the continuance of corn in the same situation as a member of the associate group year after year; and the corn itself would fall a speedy victim to its enemies and competitors if it were not regularly relieved from the consequences of its own incapacities and its failures of adaptation by the interested aid of man. We have so cherished and protected this plant for untold generations that it is permanently fixed in a state of infantile helplessness, incapable of independent competition with the other plants of its association, and about as defenseless against insect attack as is a flock of sheep against a pack of wolves. By the constant interference of our planting and our cultivating processes, and by our selection of characters which adapt the plant to our needs, to the neglect of those which might make it independent of our care, we have wholly prevented all spontaneous adaptation of the corn plant to the conditions of its own maintenance, and it has hence made no progress towards independent life during all the centuries or millenniums of its residence in our territory.

I have wondered if, in this respect, we might not improve our selection by sometimes giving the preference, in saving seed, to those plants which have best withstood unfavorable conditions, instead of making our choice, as we now invariably do where we choose at all, from among the plants which have succeeded best where all the conditions have been favorable. I would like to see the experiment made of growing corn from seed taken from the few best stalks of a field which has been overrun by insects, in the hope that we might thus gradually develop varieties of this plant capable of withstanding insect attack, or of selecting our seed from the best grown and most fruitful plants in a field which has suffered heavily from drouth—of applying, in short, the method by which rust-resistant varieties of wheat and the like are now being formed.

This imperfect sketch and discussion of the cornfield situation may serve to illustrate the value of the ecological view in compelling a comprehensive survey of the general field in which an entomological problem is involved, and a careful mustering and orderly assembling of its whole content, insuring us against the overlooking of any significant factor or the overweighting of any minor element. Whether we use the terms of ecological discussion or not, we treat our subject imperfectly if we do not use its methods and draw our data from its whole domain.

To these general suggestions, looking towards the development of our methods of investigation, I will only add a point or two pertaining to the other side of our relationship. If entomology were the sole subject of our study, we might be satisfied with our progress if we were merely contributing to the sum of available knowledge on that subject; but if it is our special task to aid in the general work of improving the conditions of life for our people, then we can only rest satisfied when we see that the conditions of their life have actually been improved. I sometimes think that only the simpler and easier part of our work has been done when we have *discovered* the truth, and that the task of making it to prevail in the practice of life is much the more arduous and difficult. Until we, or some one else for us, can hitch fact to practice, we are as helpless to move towards our main end as is a teamster with a loaded wagon who has no harness for his team.

A general practical use of our material results is, moreover, the indispensable verification of them, preceding which they are economic hypotheses only; and we can no more stop short of this final test than the physicist can omit the verification process in his experimental studies. Anything which will help us to bring to bear on our conclusions this test of average use under the ordinary conditions of economic operation must be most welcome to us, and I hope that we may get the light of each other's experience and the help of each other's suggestions on this most difficult part of our duty. I have lately found great advantage in the establishment, in relation to the work of my office, of an advisory committee, consisting, in this case, of the director of the agricultural experiment station of the state, and of two representatives of the State Horticultural Society appointed by its president, and two representatives of the State Farmers' Institute. This committee, meeting at the call of the entomologist and in consultation with him, takes his plans under consideration and approves, amends or rejects them, according to their judgment, after full statement and discussion. The law by which it is constituted, passed at

my request, provides that the appropriations of the office shall be expended on lines approved by this committee.

I have thus in frequent consultation with me a group of thoroughly representative, public-spirited men, personally or professionally interested in the various lines of our horticultural and agricultural work, who know of and believe in our undertakings and are in a position to test our results themselves in a practical way, and to influence others to test them. They stand also as advocates of the work with the general public, whose confidence in it is naturally increased by the fact that it has in advance the approval of their representatives. I am often indebted to this advisory committee for valuable suggestions, as well as for hearty support.

I am also about to propose to the State Farmers' Institute—a very active and influential body with us—a plan for individual co-operation with the office, not in the making of experiments, but in the practical use of such methods of economic operation as I have worked out to the limit of my opportunity. I hope in this way to establish volunteer demonstration stations in different parts of of the state, from which, as centers, an improved practice may spread to the surrounding communities.

Another subject which has become very practical with us in recent years is that of the legal prevention of the introduction and spread of injurious insects in our territory. We are, I suppose, practically unanimous with respect to the utility, if not the necessity, of the supervision and inspection of nurseries, so conducted as to minimize the danger of dissemination of insect and fungous pests by way of the trade in nursery stock; but we seem not to be equally unanimous with respect to the supervision, under legal authority, of the private property of the fruit grower and the farmer, with a view to the early detection and prompt removal of conditions threatening injury to the property of others. The principle involved seems to me, however, to be virtually the same in the two cases, what difference there is being in favor of the nurseryman. "Let the buyer beware," is a maxim of the common law, and under this one might reasonably expect the purchaser of nursery stock to stand the consequences of his own ignorance and inattention. He does not need to buy a particular lot of stock unless he chooses, and having chosen, it is his to do with as he likes. He may fumigate or spray or destroy it if he finds that he has unwittingly bought an insect infestation with his trees; but the owner of a valuable and well cared for orchard, free from infestation of any kind but lying beside another so infested and neglected as to make it sure that his

own will be invaded by orchard pests to his serious injury, is powerless to protect himself unless he may invoke the aid of the law. He is exposed to needless loss for which he is in no way responsible, and for which his neighbor ought in justice to be held to account. Dangerously infested property is a nuisance, and in my judgment should be universally so treated. It is true, as often said, that education and enlightened principle are in the long run a better reliance than legal compulsion, but the two are not at all incompatible, and we may have both at once. We do not find that laws making forgery or theft a crime weaken the moral sentiment of the community, but quite the contrary; neither will the passage and enforcement of laws making the maintenance of entomological nuisances a misdemeanor operate to diminish the interest of those concerned in means of detecting and measures for destroying such nuisances; they will greatly increase it rather. In my judgment, our San José scale laws are as sound in principle as our statutes concerning the contagious diseases of stock, and I am of the opinion that every entomologist should seek to have these laws strengthened and extended to all like cases, not only as measures of police but as aids to economic education.

I cannot bring to a close this address—already too long, I fear—without congratulating you upon the fact that the economic entomologist has become of recent years in a great measure a guardian of the public's health as well as a protector of its property, and expressing an earnest hope that all of us favorably situated for the purpose may lay a vigorous hold upon the problem of the relations of insects to disease, and particularly, just now, upon that of the house-fly pest—a problem of the first importance which is far from being solved. Medical opinion seems to be coming rapidly to the conclusion that the house-fly is far more dangerous to us than the mosquito, and it is certainly at present much more difficult to control. Some careful studies to this end, continued through the summer and fall under unusually favorable conditions, by a group of assistants in my office, gave us only negative results, reducing us at last to the regular removal of all materials in which house-flies can breed as the only effective means of abating this nuisance; and we found flies breeding in dangerous numbers in a greater variety of situations than we had before supposed. It will be a reproach to economic entomology if we do not soon work this problem out to a finish, and no service which we can render to our kind will be more promptly appreciated or more highly valued.

But the whole country teems with important unsolved problems

in our field, some of them, indeed, as old as agriculture in America; and new ones seem to rise faster than the old are solved. By reason of our past achievements, the country is coming to expect more and more of us, and is yearly more willing to enlarge our opportunities and support our undertakings. Whoever is privileged to look back, from this place, on the work which this Association is to do during the coming fifteen years, will certainly have a most interesting and inspiring retrospect; and, speaking in the spirit of this season of good-will to all, I wish to each and all of you joy in your work, and a large and important share in the investigations and achievements of this coming time.

Afternoon Session, Monday, December 28, 1908

The meeting was called to order by President Forbes at 1.20 p. m. The following paper was presented:

PEMPHIGUS TESSELLATA FITCH

By Edith M. Patch, *Orono, Me.*

The life cycle for comparatively few of the genus Pemphigus is known. Because the egg stage has not been found for many of this genus a tradition has sprung up that the true sexes and egg stage are commonly lacking for Pemphigus.

For several years the common Alder Blight has attracted me for various reasons, and has held my curiosity both because the migrants from the alder in September are indistinguishable from the migrant of *Pemphigus acerifolii* Riley, in July, and because there seemed to be no place in the life cycle of *Pemphigus tessellata* for a migratory generation. The apparent purposelessness of the September migrants from the alder seemed especially strange.

Perhaps a brief statement of the life cycle of *P. tessellata* upon the alder will emphasize this. We have with the first warm days in spring the hibernating generation, hardy, little, partly grown forms, coming up from under the leaves at the base of the alder where they have wintered, and establishing themselves at the alder tips in time for the first sap of the season. These, when mature, become the first of several similar successive generations of apterous viviparous forms. The last of these apterous viviparous generations in the late fall give birth to the hibernating young which completes an apparently sexless cycle for this species.

Early in September, however, migrants leave the alder in great numbers and as they do not alight upon other alders seem to be lost to any significance for the species.

Last fall, however, these migrants were present in such countless numbers about the Maine Campus that it was possible to ascertain without doubt that they were migrating to the trunks of maples,— preferably *Acer dasycarpum* Ehrh. and an ornamental cut leaved variety of that species. Alighting upon the trunk they sought crevices, gave birth to minute forms,— true apterous males and females. These females without feeding deposited eggs upon the bark.

This fact explained apparently not only the function of the migrants from the alder but the resemblance of *Pemphigus tessellata* and *P. acerfolii*, for there seems no place for doubt that the Pemphigus common upon the leaves of *Acer dasycarpum* from early spring to mid-July are hatched from the eggs of *Pemphigus tessellata* deposited upon the maple trunk.

Additional light upon the identity of these two species may perhaps be found in a collection of migrants taken on alder leaves in mid-July at the time *P. acerfolii* is leaving the maple.

There is no need for taking further time for these comments here. But as this species has been of exceeding great interest to me I have brought specimens of:

Pemphigus tessellata apterous viviparous forms.
Pemphigus tessellata migrants.
Pemphigus tessellata hibernating young.
Pemphigus tessellata males, females and eggs.
Pemphigus acerifolii migrants.

These will be here during the session and can be seen by any who wish.

PRESIDENT FORBES: The paper is now before you for discussion.

C. L. MARLATT: Mr. President, I am sure we all are very much interested in this paper by Miss Patch. She has done a very creditable piece of work and has cleared up some facts in the life history of this insect, and thrown light on the general subject. I am sure I, for one, feel very much indebted to her and am very much interested in the work she has already published. I wish also to compliment her on the clearness and brevity with which she presented her paper. It will be a lesson to many of us.

President Forbes called First Vice-President Britton to the chair.

CHAIRMAN BRITTON: The next thing on the program is the discussion of the presidential address.

MR. WASHBURN: Mr. President, I think it admits of no discussion whatever.

PRESIDENT FORBES: I suspect, if the discussion is limited to those who heard it in full, that it will be very brief indeed.

MR. SHERMAN: Mr. Chairman, I would like to hear some one else make some comments. One point which struck me especially was the necessity of the entomologist making sure that his recommendations are not only published, but to see that they are followed in actual practice on the farm. I think he is right in saying we lose the most important part of our work if we let it go at publication and do not make certain that it reaches the persons who need it. I don't know what the method is in other states, or even in Dr. Forbes' own state, but I do know that in my own state, and all the other states that I have worked in, the value of probably nine tenths of the bulletins sent out is lost because they are not so distributed as to reach those who need them most. I think that we do lose more than half of the effectiveness of our work because we fail to put it out in such a way as to have it become a part of the actual practice of the farmer.

MR. SYMONS: Mr. President, I think that the suggestion by Dr. Forbes, of entomologists consulting with the agriculturists and horticulturists in planning out future work, is certainly one to be commended and one that we should all adopt so far as possible. There is no doubt that many of our lines of work overlap. Suggestions from men working along agricultural lines particularly should certainly be very gladly received by the entomologists.

MR. SANDERSON: Mr. President, one thing that struck me in Dr. Forbes' address is that relating to the production of plants resistant to insects, by selecting those individuals which had survived under the unfavorable conditions. I don't know whether very much has been done along that line by entomologists. There was some work done with cotton and other crops, and there has been considerable done by the plant pathologists. I also heard a paper at Lansing, Michigan, about a year ago, suggesting the production of resistant plants by selecting individuals which have come from fields infected with various diseases, such as the wheat rust, oat smut, potato diseases, etc. There might be a question whether this is a field for agriculturists or entomologists. It seems to me that it is a place for team work, and I think we want to get more of that in tackling the fundamental problems connected with insect investigations. It is of fundamental importance that the agriculturists, entomologists and horticulturists should all work together to develop such resistant varieties.

Another point in regard to giving results statistically, seems to me needs emphasis, although we are all tending that way. With problems requiring extended investigations, the results must be given statistically and with enough fullness to demonstrate the results. Otherwise, they are of very little value when compared in different sections of country and under different conditions. Every important investigation that is made seems to testify to the necessity of such records.

MR. HOPKINS: Mr. President, I regret that I did not arrive in time to hear all of the address, but I want to emphasize the remarks just made in regard to it and in regard to the importance of making observations on resistant varieties of plants. I think there are great possibilities here. It is one of our projects in the investigation of forest insects. I have urged it upon the Forest Service, and it has finally been taken up. It is a thing which has been almost entirely neglected, especially in forestry work in this country. As an example, in making sales of timber from a national forest contractors are required to leave a certain number of trees to the acre for seed trees, without specifying what kind of trees shall be left. Naturally, the worthless scrub trees are left to produce seed. From what we know of the laws governing such things, we can prophesy what will happen if this method is continued. I wish to call especial attention to the Black Hills National Forest, where a very large per cent of the timber has been killed by bark beetles. In that reserve we found trees that had escaped injury. They were entirely immune, apparently. It may have been an accident, but the chances are it was not. These trees are worth thousands of dollars. From what we know of the principles governing such things, these trees should be saved, and the seed should be planted, in order to build up a more resistant race of trees. That is nature's method. The trees more resistant have been perpetuated. This is very important. It should be considered by the entomologists as well as by the plant pathologists.

MR. SUMMERS: Mr. Chairman, one of the points that was of interest to me was in relation to the protection of one man's property from disease on his neighbor's property. I have not looked over the laws of the different states with this particularly in mind, and I wonder if a good many laws are not so worded today that we have, as inspectors, a good deal of power in that direction—more than is exercised. I know that is true of the Iowa law. It permits the entomologist to enter upon and destroy diseased trees that are dangerous to his neighbors, and that power has been exercised in one or two cases, but the greatest difficulty is that public opinion has not yet reached the point where it will justify any extensive action of that

kind. It seems as if public opinion will have to be raised to a higher standard before the power that at present exists can be exercised so as to have any widespread influence. There is a tendency in that direction, however. I was gratified, during the State Horticultural Society meeting in Iowa a month ago, at the appearance of a paper that I had not heard of until it was presented, recommending the embodying into Iowa law of provisions that would permit of this very thing, the author not knowing that it was already a part of our law which was not enforced.

PRESIDENT FORBES: Mr. Chairman, if you will permit me, in closing this discussion, I would like to say that I had thought of including these statements among those in the address, for the reason that there is just now a very decided pressure upon me, as state entomologist, in that part of the state devoted to commercial horticulture, to do that very thing, and which, in my state, as in Iowa, I have authority to do under the law. In fact, although it was passed as a horticultural measure, our present San José scale law is a very general law, and the attorney-general tells me that I have the power to go into a man's wheat field and ascertain whether he is breeding Hessian flies that are liable to escape to his neighbor's field, and, if he is, I can prescribe any measures I think necessary under the circumstances.

I think very likely we shall find that we have more power than we should want to exercise, unless it is in some such case as that I spoke of in Illinois, where the great mass of the people want to raise fruit and are willing to do what is necessary to that end, but where, here and there, a man abandons the care of his orchard, to the great danger of every one in the vicinity.

(President Forbes took the chair again at this point.)

The remainder of the morning session was devoted to business matters.

PRESIDENT FORBES: Our next topic is "The Economic Status of the House-Fly," by Mr. Felt.

THE ECONOMIC STATUS OF THE HOUSE-FLY

BY E. P. FELT, *Albany, N. Y.*

The house-fly is such a common insect that altogether too much has been taken for granted. Up to recently it has been considered simply as an inevitable nuisance. Later developments have shown that this insect may be an important factor in the dissemination of certain diseases.

Typhoid fever is one of the most serious ailments to which man is subject. There are about 250,000 cases of this disease annually in America, about 35,000 proving fatal. Sixty per cent of the deaths in the Franco-Prussian War and 30% of the deaths of the Boer War were caused by this disease. Positive statements have been made to the effect that the house-fly was an active agent in the dissemination of this disease, while certain reputable physicians consider this charge unproved. The Spanish-American War, if it accomplished nothing else, called attention in a most forcible manner to the part flies might play in the dissemination of typhoid bacilli. Dr. M. A. Veeder of Lyons, writing in 1898, was very strongly of the opinion that the house-fly was largely responsible for the dissemination of this disease in camps. Dr. Walter Reed, writing of an outbreak near Porto Principe in the annual report of the War Department, states that the outbreak "was clearly not due to water infection but was transferred from the infected stools of patients to the food by means of flies, the conditions being especially favorable for this manner of dissemination." Dr. L. O. Howard, writing in 1899 on the fauna of human excrement, quotes from Dr. Vaughan, a member of the army typhoid commission, as follows:

27. Flies undoubtedly served as carriers of the infection.

My reasons for believing that flies were active in the dissemination of typhoid may be stated as follows:

a. Flies swarmed over infected fecal matter in the pits and then visited and fed upon the food prepared for the soldiers at the mess tents. In some instances where lime had recently been sprinkled over the contents of the pits, flies with their feet whitened with lime were seen walking over the food.

b. Officers whose mess tents were protected by means of screens suffered proportionately less from typhoid fever than did those whose tents were not so protected.

c. Typhoid fever gradually disappeared in the fall of 1898, with the approach of cold weather, and the consequent disabling of the fly.

It is possible for the fly to carry the typhoid bacillus in two ways. In the first place fecal matter containing the typhoid germ may adhere to the fly and be mechanically transported. In the second place, it is possible that the typhoid bacillus may be carried in the digestive organs of the fly and may be deposited with its excrement.

Dr. Alice Hamilton in 1903, studying the part played by the house-fly in a recent epidemic of typhoid fever in Chicago, which could not be explained wholly by the water supply, nor on the grounds of poverty or ignorance of the inhabitants, captured flies in undrained privies, on the fences of yards, on the walls of two houses and in the room of a typhoid patient and used them to inoculate 18 tubes from

five of which the typhoid bacillus was isolated. She further found that many discharges from typhoid patients were left exposed in privies or yards, and concluded that flies might be an important adjunct in the dissemination of this infection. More recently, Dr. Daniel D. Jackson, investigating in 1907 the pollution of New York harbor, found that by far the greater number of cases occurred within a few blocks of the water front, the outbreak being most severe in the immediate vicinity of sewer outlets. He gives a series of charts showing an almost exact coincidence between the abundance of house-flies and the occurrence of typhoid fever when the dates are set back two months to correspond to the time at which the disease was contracted. The bacilli of typhoid fever were found by Ficker in the dejecta of house-flies 23 days after feeding, while Hamer records the presence of this bacillus in flies during a period of two weeks. Most significant of all, it should be noted that competent physicians in position to make extended observations upon this disease and the methods by which it may become disseminated, are most strongly of the opinion that under certain conditions at least, the fly is a most important factor. Epidemics spread by flies, according to Dr. Veeder, tend to follow the directions of prevailing warm winds. He considers flies the chief medium of conveyance in villages and camps where shallow, open closets are used, thus affording the insects free access to infected material, and where it is possible to eliminate water and milk as the sources of infection. Drs. Sedgwick and Winslow, writing in 1903, state that "the three great means for the transmission of typhoid fever are fingers, food and flies," the authors holding the last to be the most important.

The possibilities of transmitting typhoid fever are appalling to the layman when it is remembered that the germs of this disease may be in the system several weeks before diagnosis is possible, continue in numbers six to eight weeks after apparent recovery, and in exceptional cases may be discharged from the system during a period of several years. There are authentic records of a patient distributing these germs for seventeen years and being the incipient cause of thirteen cases during fourteen years of that period. Furthermore, Dr. M. A. Veeder of Lyons cites a case where typhoid fever was perpetuated from year to year in a locality, ascribing it to a physician recommending the burial of all typhoid excreta and the execution of this direction by a favorite nurse. It is well known that soil infected by these germs may be the origin of new cases, and Dr. Veeder significantly observes that the annual recurrence of typhoid fever in the above mentioned locality ceased with the death

of the two parties mentioned above and a change in the method of disposing of typhoid discharges.

The evidence against this insect may, therefore, be summed up briefly as follows: Virulent typhoid bacilli have been found upon the legs and within the bodies of this insect, persisting in the latter case for 23 days. A number of serious outbreaks have been observed by competent physicians, where infection through a common water or food supply did not satisfactorily explain the trouble. This positive evidence, while not establishing beyond all question the culpability of the fly, is further supported by the opinion of a number of reputable physicians who have had extensive experience with outbreaks of this character.

The evidence showing that flies may play an important part in the diffusion of cholera is, according to Dr. Nuttall, absolutely convincing. He cites experiments showing that cholera bacilli may be found on flies in large numbers, while they may occur in the dejecta within 17 hours after feeding and as late as four days. Infected flies have been given access to milk and cholera cultures made therefrom.

Typhoid fever and cholera, while both serious infections, are by no means the only diseases which may be conveyed by flies. Certain forms of diarrhœa and enteritis are undoubtedly due to specific germs, and there is no reason why the bacilli causing these infections may not be carried as easily and in the same way as those responsible for typhoid fever. The monthly bulletin of the New York State Department of Health for October, 1908, states that during 1907 there were in New York state 37,370 deaths of infants under two years of age, 9,213 being due to diarrhœa and enteritis. Careful investigators, it is stated, have placed the proportion of deaths between bottle-fed and breast-fed babies as 25 to 1. Physicians recognize the necessity of providing pure milk for young children, and in most instances it is comparatively easy to see how flies might be responsible for the major portion of the infections, since they usually occur in numbers about stables, in the vicinity of milk houses, in the neighborhood of milk stations, on milk wagons and, in fact, are found in greater or less numbers wherever milk is stored. Martin states that each succeeding year confirms his observation of 1898 to the effect that the annual epidemic of diarrhœa and typhoid is connected with the appearance of the common house-fly, while Nash in *The Lancet*, records no mortality from diarrhœa among infants at Southend during July and August, 1902, this immunity being accompanied by the almost complete absence of the house-fly. This insect was abundant in that locality in September and coincidentally epidemic

diarrhœa developed. Sandilands, in the *Journal of Hygiene* states that the great majority of cases of diarrhœa are due to the consumption of infected food, and suggests that the seasonal incidence of diarrhœa coincides with, and results from, the seasonal prevalence of flies. Dr. Jackson records several epidemics of a malignant type of dysentery radiating from a single point and disappearing entirely when proper disinfection of closets was enforced.

The evil possibilities of the fly are by no means exhausted in the above recital. It is well known that flies feed upon sputum. Experiments by Lord recorded in the *Boston Medical and Surgical Journal* show that flies may ingest tubercular sputum and excrete tubercular bacilli, the virulence of which may last for at least 15 days. He considers the danger of human infection from this source to lie in the ingestion of fly specks on food, and suggests that during the fly season great attention should be paid to the screening of rooms and hospital wards containing patients with tuberculosis and laboratories where tubercular material is examined.

Nuttall considers that the evidence previously submitted proves that the house-fly may carry about and deposit anthrax bacilli, though there may be a question as to how generally flies are responsible for the dissemination of this disease. Parke admits the possibilities of flies distributing, in addition to those mentioned above, plague, trachoma, septicemia, erysipelas and leprosy. Furthermore, there are those who would hold flies responsible for the more frequent new cases which occur in a zone immediately surrounding the smallpox hospital and which may be due either to the wafting out of infected particles or their carriage by flies. The latter is considered the more probable. Howe, according to the statement of Dr. Howard, has demonstrated that the purulent conjunctivitis of the Egyptians is spread by the house-fly. The experiments of Grassi show that the eggs of Taenia, Trichocephalus and Oxyuris pass uninjured through the alimentary tract of flies.

A word respecting the dissemination of flies may not be out of place in this connnection. The experiments by Dr. L. O. Howard several years ago illustrated in a striking manner the possibilities of reducing the number of flies by giving adequate treatment to accumulations of manure in the vicinity. This is very satisfactory so far as reducing the annoyance caused by flies is concerned. There is a phase of this question which has apparently received little consideration, namely, the conveyance of flies by vehicles of one kind or another. It only requires a little observation to convince one's self that the butcher cart of the country is a very efficient carrier of flies, pre-

sumably receiving accessions and leaving individuals at almost every stopping place, even though the route traversed may occupy an entire day. Furthermore, trolley cars and, to a more limited extent, express cars carrying sacked meat or other supplies attractive to flies, may become important factors in the conveyance of disease-bearing flies. It is only necessary for these carriers to load where conditions are favorable for the infection of flies and we may have a mysterious outbreak at some distance from the source of trouble.

It is admitted that flies are comparatively harmless if they have no chance of becoming infected. The difficulty is to distinguish between the harmless individual and the one fairly reeking with typhoid germs or some other undesirable infection. Dr. Howard's experiments have shown the practicability of reducing largely the numbers of this ubiquitous pest, while medical science is in position to instruct respecting the care of all infectious material. Coöperation on the part of both with general support from laymen throughout the country should result in a material betterment of conditions.

PRESIDENT FORBES: Any discussion of this paper?

MR. WASHBURN: In connection with Dr. Felt's paper, I should like to ask if any one has definite information on this point. Several years ago, after the Spanish War, the statement was made, I think in a meeting of this Association, that we lost by Spanish bullets only 250 men, whereas by the agency of the house-fly we lost 5,000. Now, I don't think Dr. Skinner would like to be quoted here on that subject, but I should like to ask whether that is an exact statement or only a broad estimate.

MR. BRITTON: Mr. Chairman, I might say that one of our young members was a soldier in camp at Chickamauga, and that he worked for me two or three years. He tells me that the sinks there were wholly unprotected and that a large proportion of the soldiers contracted typhoid fever, and that no precautions were taken to protect them from the flies, which fairly swarmed over the excrement and later over the food in the mess tents, until some of the authorities from Washington went down there. After that, it was changed, of course. But that seems like an unnecessary neglect on the part of the officials in charge of the camp. The men were there, and they had nothing to do except to keep the camp as clean as possible, and it seems almost like criminal negligence to have allowed such a condition to exist.

MR. WASHBURN: It seems to me, in this connection, that the en-

forcement of the anti-spitting ordinances on the street cars and in various other public places might come in for some attention, and if flies do spread disease from sputum, as they probably do, it is singular that in localities where spitting on the sidewalk is more prevalent we do not find more of those diseases than in others where the laws are more strictly enforced.

MR. HUNTER: Mr. President, I don't think that Dr. Felt exaggerated the importance of this subject at all. On the contrary, I am inclined to think that he went to the other extreme in minimizing the importance of the house-fly in the spread of diseases. Recently, some work was done in the Hawaiian Islands by Dr. Cobb, not with the house-fly, but with an insect instrumental in the dissemination of a disease of the sugar cane. The results of his work throw a great deal of light upon general matters connected with the transmission of diseases by flies. He found that the excreta of a Sarcophagid fly served as a perfect cultural media for the germs passing through the alimentary canal. Each defecation therefore provides a medium that augments greatly the chances of the spores taking hold of the plant. This refers to an entirely different fly, but isn't it possible that in the case of the house-fly something very similar takes place? That opens up an entirely new category of conditions under which the house-fly may transmit diseases. Dr. Felt, I think, did not mention one case of the transmission of disease by flies, brought to the surface recently by physicians connected with the British Army Corps in India. In India, in Ceylon, and the Philippine Islands, they have a troublesome disease called yaws. Dr. Robertson, of the British service, having charge of a camp in the regions infected with yaws, tried the experiment of carrying the infection by meats and flies. The patients were instructed from time to time to anoint their sores with a certain preparation, but during the course of this experiment to do nothing of the kind, but to collect all the house-flies they could, and they collected 200 specimens of the house-fly, which were put into distilled water and shaken up. A dozen flies were taken from the water in the flask, and they showed the specific organism, the cause of the disease. The connection between house-flies and tuberculosis is given entirely too little attention. A great deal has been written and said respecting flies and typhoid fever, but it occurs to me that when the matter is gone into more thoroughly, we shall find flies much more important and dangerous in the transmission of tuberculosis.

PRESIDENT FORBES: If there is nothing further on this subject, we will take next the paper on "Notes on Cranberry Pests," by H. J. Franklin, which will be read by Mr. H. T. Fernald.

MR. FERNALD: A word of explanation is perhaps due to account for my presenting this paper. The work on this subject was done in Massachusetts by Dr. Franklin before he went to Minnesota, and, through the kindness of Professor Washburn, it has been sent to me, simply because I represent the state where the work was done.

NOTES ON CRANBERRY PESTS

By HENRY J. FRANKLIN, *Saint Anthony Park, Minn.*

In studying the life histories of various cranberry bog insects on Cape Cod during the season of 1907, certain interesting points were discovered concerning the life history of *Peronea minuta* (Robinson) which do not appear to have been published. This insect is two-brooded in Massachusetts and three-brooded in New Jersey. The winter brood of moths in Massachusetts are slate-gray in color, but the summer brood are orange red. In New Jersey also, the winter brood is slate gray, but the two summer broods are both orange red in color.

The fact that the species is dimorphic in the adult state has been long recognized, and Prof. J. B. Smith has recorded (Farmers' Bul. No. 178, U. S. Dept. Agric., p. 13) a marked dimorphism on the part of the larvae. Speaking of the last brood of worms in New Jersey he says: "Eggs laid by these moths" (those of the last summer brood), "do not hatch until in August or even early September, and the worms that come out of them grow slowly as compared with the earlier broods. Few of them spin up more than a single shoot, and few of them eat into any but the smallest berries. They also tend to become reddish in color and even striped, so that at one time they were believed to form a distinct species, described as the 'red-striped cranberry worm.'" In this we find a difference not only in color, but also in habit, as the worms of the other two broods are pale yellow in color and those of at least one of these broods usually draw together a number of shoots in a single web and eat into the fruit voraciously. In Massachusetts as well as in New Jersey this last brood of worms, which later changes into the winter brood of moths, has a tendency to "become reddish and even striped" and grows slowly as compared with the caterpillars of the other brood. In Massachusetts, however, this brood of worms is the one which is often very injurious to the vines and the berries. This difference in habit between Massachusetts and New Jersey is doubtless due to the fact that the cranberry

vines are not in the same condition in both regions during the time that this brood of worms is at work.

In Massachusetts, the second brood of worms all have yellow heads in all stages of their development, and when they first hatch from the egg they do not burrow into the tissues of the leaves on which they feed, but they leave the egg-shell through a circular exit-hole and go at once into the higher portions of the vines and commence to spin up the tips. The first brood, on the other hand, have considerably darkened heads in their early stages and may readily be mistaken for young larvæ of the Blackhead Cranberry Worm (*Eudemis vacciniana*). Like the young caterpillars of that species they bore straight into the tissues of the leaves on which they hatch, destroying the egg-shells in the operation and leaving a pile of frass over their entrance holes. They work around within the tissues of the leaves for some time before they leave them to go in to the tips of the vines. Some of the worms of this brood continue to have somewhat darkened heads until they become full grown. It would be interesting to know if the first brood of the worms of this species in New Jersey present the same peculiarities of habit and appearance that they do on Cape Cod and also if the second brood agrees with the first one in these respects.

A comparison of the pupation habits of the fire worm (*Eudemis vacciniana*) on Cape Cod and in Wisconsin is interesting. On Cape Cod the worms of both broods of this species go down out of the vines on to the surface of the bog to pupate on the sand and among the fallen leaves. In Wisconsin, on the other hand, (Cf. C. B. Hardenberg, Bul. No. 159 of the Wisconsin Experiment Station, page 7), these worms usually pupate in the spun up tips of the vines, only a small percentage passing the pupa stage on the surface of the bog under the vines. The bogs of Cape Cod are as a rule well drained, while those of Wisconsin are not, and it is probable that the dampness of the bog surfaces in Wisconsin makes them unsuitable localities for the insect to pupate in. It would be interesting to know, however, if this difference in pupation is a real inherent difference of habit or a difference forced upon the insect by the surrounding conditions.

It was found to be a common thing, on the strictly dry bogs of Cape Cod, for certain undetermined species of ants to collect both yellow-headed cranberry worms and fruit worms in large numbers and take them to their nests, presumably as food. I several times saw as many as fifty such worms, all at one time and within a radius of twelve feet, being dragged along by these ants, the ants as a rule

working singly. It is certainly advisable that the nests of these valuable allies of man should not be disturbed by the cranberry grower, and these observations suggest the possibility of developing the use of ants as a means of combating these pests on dry bogs, either by encouraging the species already present, possibly by the use of artificial nests, or if possible, by the introduction of some closely allied but more prolific species.

PRESIDENT FORBES: Any discussion of this paper?

MR. R. L. WEBSTER: Mr. President, I was very much interested in the remarks on the cranberry worm, inasmuch as I have just finished some experiments on its life history in Iowa, where the insect is a pest on apple stock in the nursery. In southern Iowa, and as far north as Des Moines, this species is three-brooded, and there was no indication of the difference in the color, either in the head or in the general color of the larvæ. I found no larvæ on apple, which I could call red-striped, in any sense of the word. The three broods, as far as I could see, all had the same appearance.

Early in the spring, I found eggs only on the lower part of the apple trees in the nursery. They seemed to be deposited before the leaves had come out very far on the trees, all on the lower part of the trees, perhaps within a foot or six inches from the ground. In this way, only the lower limbs on the trees were infested. The leaves higher up did not have any larvæ at all. The remaining two broods deposited eggs, as far as I could determine, on the leaves. I saw none at all on the limbs, as in the case with the first brood. In the second and third broods the larvæ seemed to be feeding all over the trees, principally in the tips of the young growing leaves. The first and second broods of moths were the orange form, and the last brood the slate form as in New Jersey.

PRESIDENT FORBES: Anything further on this subject?

MR. HOPKINS: Mr. President, I think the matter has come up before this Society before, and while we are considering the matter of nomenclature, we ought to settle on the use of the terms "brood" and "generation." Sometimes it is necessary to refer to the particular brood. It seems to me there ought to be a certain uniformity.

PRESIDENT FORBES: The following paper will now be presented: "An Example of Forest Insect Control at a Profit," by Mr. A. D. Hopkins.

A. D. HOPKINS: Mr. President, I did not expect to present this paper, but, owing to the fact that a rather striking example was

reported recently, I took these extracts from manuscripts already prepared in order to call attention to the fact that some of our most destructive forest insects can be controlled without cost, and often at a profit.

AN EXAMPLE OF FOREST INSECT CONTROL AT A PROFIT

By A. D. Hopkins, *Washington, D. C.*

In May, 1907, Mr. W. D. Edmonston, a forest ranger, detailed from the forest service to the Bureau of Entomology, to work under our instructions in the location of evidences of beetle infestation in the National Forests of Colorado and adjoining states, reported that the pine timber was dying on a large estate not far from Idaho Springs, Colorado, and in the adjoining Pikes Peak National Forest. Mr. Edmonston was then instructed to make more detailed examinations, after which he reported that some 63,000 feet of standing timber on the estate was infested by the Black Hills beetle and that unless the ravages were checked at once it would kill the timber not only on this estate, but that on the adjoining estates and National Forest. The owner of the property was advised by the Bureau of Entomology to take radical action according to a special recommendation and detailed instructions relating to a necessary control policy. No action was taken, however, before the first of the following July, and therefore not in time to prevent the broods of beetles from swarming from the infested trees and extending their ravages. In December, 1907, Mr. Edmonston was instructed to make another examination of the timber, when he found that his prediction was being fulfilled, and that instead of 65,000 feet of timber in the old infestation, there was nearly four times as much timber involved in the new, or over 250,000 feet. The owner was again notified of the serious character of the outbreak, and the further suggestion made that if the logs from the infested trees were converted into lumber and the slabs burned before May, 1908, it would result in the protection of the remaining living timber. Immediate steps were then taken by the owners to carry out the original recommendations. Mr. Edmonston gave instructions to the manager of the estate in locating and marking the infested trees and in the essential features in the methods of utilization to destroy the necessary number of beetles. He also marked the infested timber on an adjoining estate and on the National Forest. Five months later, in May, 1908, Mr. Edmonston reported that the larger clumps of infested trees on the estate had been converted into lumber and the slabs burned, and that the

marked trees on the adjoining estate and National Forest had been cut and barked. In November, 1908, Mr. Edmonston was instructed to make another inspection of the forest on the estate and surrounding area, and on December 1 he reported: "Nothing could be more satisfactory than the results obtained by the cutting of the infested timber on the estate. Your recommendations and instructions submitted to the owner, and carefully followed by the manager of the estate, have clearly demonstrated that insect infestation can be controlled and at no expense to the owner of the timber involved, in fact a very satisfactory price was realized, resulting in a net profit, I understand, of $5 per thousand feet, board measure, on the 240,000 feet cut. This, of course, does not include the profit of the milling operations, but for the logs sold at the mill, after deducting the expenses of cutting and logging. The sawmill was owned and operated by an Idaho Springs firm, and the manufactured article sold in that town. I spent six days on the estate, November 18th to 23d. After a very thorough examination of the timber, I found only three infested trees, isolated individuals, and over a mile from where the large clumps of infested trees were cut. With the exception of those three trees, there is no new infestation on the estate. I also examined the adjoining lands, but no new infestation was observed. The infested trees which I marked in December, 1907, had all been cut and barked. On the Pike National Forest, contiguous to the first mentioned estate, where you will remember I marked some clumps of infested trees, no new infestation was found, not one tree. I found that all the infested trees had been cut and barked. Ranger Kelso had charge of this work, and it has been quite thoroughly done."

This most gratifying result demonstrated two important things: one, that a quite extensive outbreak by one of the Dendroctonus beetles involving more than 1,000 trees can be controlled without expense, and even at a profit, whenever the conditions are favorable for the utilization of the infested timber; the other, that the essential details of the recommendations and expert advice based on the results of scientific research can be successfully applied by a manager of a private forest and the rangers of national and state forests. It also indicates quite conclusively that the widespread depredations in the Black Hills Forest Reserve could have been prevented with very little expense to the government if the matter had received prompt attention in 1901, when the first investigations were made and essentially the same recommendations submitted. But, through the lack of public appreciation of the importance of the problem at the

time, and the lack of sufficient authority and funds later, it was allowed to extend beyond practical control and in consequence a large part of the timber of the entire National Forest has been killed. There were then no forcible examples of the practical value of such recommendations based on scientific research and no other argument was effective in arousing public interest in the threatening character of the outbreak or confidence in scientific advice or methods or control. Now we have several examples demonstrating the practicability of forest insect control in America which should lead to confidence in the results of research as a basis for success in practical application.

PRESIDENT FORBES: Remarks on this paper are now in order.

MR. WASHBURN: What is the annual loss from *D. ponderosæ?*

MR. HOPKINS: About a billion feet has been killed in the Black Hills National Forest and at least 10% of the matured timber in the southern half of the Rocky Mountain region within recent years.

PRESIDENT FORBES: The Association may perhaps be interested to know the results of some forestry insect work that we have done this last season in Illinois. Our situation is a little peculiar there in that respect. Although state entomologist, I am also charged by the state law with the natural history survey of the state, which is directed primarily to economic and educational ends, and among the enterprises which we have lately taken up under the impulse of this conservation movement, which has led to consultations of governors, experiment station workers and others, has been a forestry survey of the "Prairie State." We are not supposed to have any forests in Illinois, but, nevertheless, we have enough there to make it worth while to take care of them and to increase the supply of local timber.

Arrangements were made for one of the United States forest rangers to go into one of our tracts, and he made a careful expert examination of them, at an expense which was shared by the natural history survey of the state and the forest service. One of our own force, who had special training in this line, went with this ranger. When the reports came in, it was found that the insect problem was really the most serious of the whole situation, and that as many as ninety per cent, in some cases, of the forest trees standing on these selected areas were infested by borers to such an extent as to make them practically worthless, because following the insect infestation, came invasions by fungi and internal tree rots and the like, which rendered the timber very short lived. I think that any of us who

work in the field will find that insect infestation will be one of the great problems we shall have to deal with in order to accomplish anything either toward the development or maintenance of existing forests. It was a great surprise to all of us. It was found that as the forest lands were being cleared of the remnants of the forest operations by timber cutting, the insects were obliged to confine their operations to the constantly decreasing area of trees, and these depredations upon the smaller areas became so great that insects which originally infested a considerable extent of territory were gradually being herded into smaller areas, to such an extent that it began to look as though there was nothing there but bugs.

A. D. HOPKINS: Mr. President, I want to thank you sincerely for this talk on the forest insects. This is, I believe, practically the first time any one has supported the idea that forest insects are really important; it is most gratifying. Evidence is piling up that insects are causing more actual financial loss, to merchantable timber, than is being caused by forest fires to the same class of timber. I am willing to stake my reputation that this is true, so far as affecting matured timber is concerned, not the reproduction. Of course, there is no way to be positive as to cash value, because we have many complications to figure on, but every evidence indicates that the annual loss by insects to forests in the United States exceeds a hundred million dollars in value. Insects make no show like the smoke coming from the fire, though they are quietly working away on the matured timber and causing a little injury every year, so that in the course of a period of years there is an accumulation of injury not seen until the timber is sawed up, and then the real loss is apparent. Of course, in the West square miles of timber are often killed by insects within one or two years. We hope that forest insects will before long receive their due share of attention.

MR. BRUNER: Mr. President, I want to add to what Dr. Hopkins has said with reference to the destruction of mature timber, since I spent considerable time several years ago in investigating the destruction of trees, on tree claims in the West. I found, in most cases, that the failure to have the proper number of trees at the end of the period was due entirely to the work of insects. Propagation of forest trees is largely held in check by insects of various kinds: those that work on small trees. I became interested in the insects that were attacking young trees at the time of studying this problem of the tree claim insect pests. I have still continued to hold that interest, and have noticed, wherever I go in the forests, that immense numbers of young trees are annually being destroyed by insects of

various kinds, not only by species that defoliate trees, but those that work in the trunk and by insects that devour the seeds. I have been trying to persuade our forestry school at the University of Nebraska that the study of insects, in their relation to forestry, was one of the most important features they had at the school. I can agree with Dr. Hopkins that the insects are far more important in destroying our forests than fires.

I have made observations also in relation to the wiping out of Dendroctonus in various parts of the Rocky Mountain region. One instance in mind is an estate of pretty nearly 100,000 acres in the southern part of Colorado, where the cleaning out of about eighteen hundred trees according to the directions of Dr. Hopkins prevented the spread of Dendroctonus on the estate. I visited the estate two successive years, and found that the insect, while not exterminated, had been so thoroughly cleaned out, that the birds were able to take care of the remainder. I found four trees in a portion of the estate that were not taken out at the time the general clean-up was made. The birds had found those trees and cleaned them to such an extent that it was almost impossible to find specimens for the cabinet.

A MEMBER: Mr. President, I would like to ask Dr. Hopkins whether our forest insects are confined more to the evergreens than to the hard wood growth.

MR. HOPKINS: The damage is far more conspicuous in the conifers, but I believe, in taking the average, that the hard woods will show an equal, if not a greater, loss. Chestnut timber, especially throughout the eastern United States, is damaged from twenty-five to fifty per cent, in the aggregate. Matured oaks, red and white, are injured by timber worms and their value greatly reduced. Nearly all the hard woods suffer more or less, and the product is reduced in value by work that is not conspicuous; but in the conifers, where Dendroctonus beetles attack the trees, it is conspicuous.

MR. COOLEY: Mr. President, I would like to add that a large per cent of the seeds of forest trees are destroyed annually in Montana by an insect resembling the larva of the codling moth. In some cases over ninety per cent are destroyed. I have had this matter under observation for several years.

MR. HOPKINS: I am very glad to learn that you are studying that insect. It is specially destructive to the seeds of *Pinus ponderosa*. I do not know that the species has been positively identified.

PRESIDENT FORBES: The next paper will be "Notes on *Empoasca mali* LeB.," by Mr. F. L. Washburn.

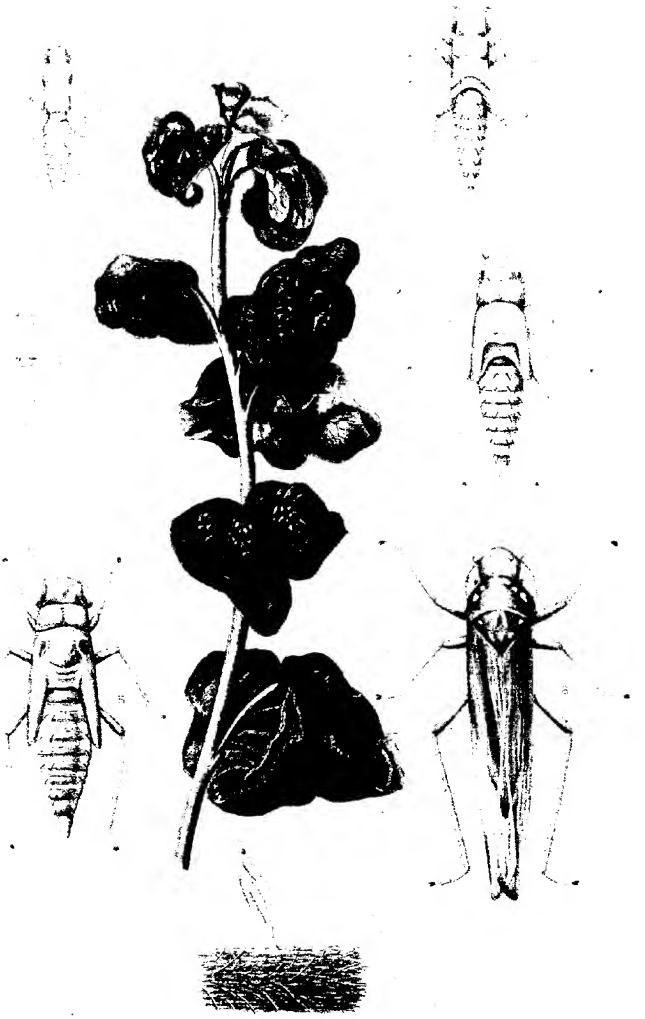
NOTES ON EMPOASCA MALI LE B.

By F. L. WASHBURN, *St. Anthony Park, Minn.*

The following observations resulting from two years' work with the above named insect, illustrate, it is believed, some hitherto unknown facts in connection with its life history. These points are best discussed under separate headings, namely: 1. The Fall-Laid Egg; 2. Oviposition during the Summer Months; 3. Food Plants; 4. Different Stages and Number of Broods; 5. Economic Suggestions.

1. **The Fall-Laid Egg:** The finding of egg blisters on young apple trees in 1907 was reported before this Association at the last annual meeting, and pictures of the blisters exhibited. That paper, with illustrations, was published in Vol. 1, No. 2, of the JOURNAL OF ECONOMIC ENTOMOLOGY. The blisters shown in that article measured about .75 mm. long by .4 mm. broad, and the fact that Empoasca was reared from them authorizes the statement that they belonged to this species. These blisters were found upon the apple. Certain egg blisters on the small branches of the elm, similarly located with respect to the new growth of the elm, were found this year by Doctor Franklin, and they appear to be the same as the blisters found upon the apple. We were able to discover no difference between these and the apple blisters, the measurements were the same, and they were the same in general appearance. The contained eggs were like those contained in the blisters on the apple. It seems possible that these are also blisters of *E. mali,* or perhaps some very closely allied form. The fact that the elm and the apple are not closely related may not be taken as evidence against this, for it is quite possible that the character of the bark which the tree bears on its small branches may have a more important bearing upon this matter than does the relationship of the species. The egg contained in the blister upon the apple is about as long as the blister itself, hyaline and semi-opaque. It is covered by the epidermis and the corky portion of the bark, and only a thin layer of cortical parenchyma. The eggs are much narrower than their blister-like envelope, measuring only .2 mm. in their greatest width. In cross section they are nearly circular, slightly curved from end to end, and round at the points. Further, they are of about

EXPLANATION OF PLATE 2: Figs. 1, 2, 3, 4 and 5 represent five successive stages of the nymph; Fig. 6, the adult leaf hopper; Fig. 7, the newly hatched nymph (summer) issuing from petiole of clover. The central figure illustrates the appearance of the terminal portion of an apple twig upon which this leaf hopper is working. (Reprint from 12th Rept., State Ent., Minn. 1908.)



APPLE LEAF HOPPER.

equal width throughout their length. The shell, as one would naturally expect, is very delicate, and the egg is dissected out of the bark with difficulty.

These eggs, when first examined, were filled with a semi-transparent liquid material, which was broken up somewhat into small globules. When collected and examined later, on November 2d, many of them were still in this condition, and many were somewhat cloudy within, in spots, and in some the young nymph, though still very small, could be seen to have already taken form. At that time these nymphs were white in color, and occupied only a very small part of the interior of the egg. They could be seen to move very slightly now and then.

We have been unable to find fall-laid eggs in any herbaceous plants, though many such which were swarming with Empoasca during the summer, were most carefully examined in the fall. It is believed from the following observations that in Minnesota these fall eggs are laid from the middle to the latter part of September. Egg pockets (measurements of which correspond exactly to those on nursery stock from which *E. mali* was reared) were first found in abundance September 23 upon the smaller branches of apple trees in an orchard eight years old, located next to an alfalfa field which was very heavily infested with *E. mali* during the summer. Each pocket or blister contained a single egg, apparently fresh. At that date the hoppers were less abundant in this alfalfa field than they had been, and had been growing markedly less throughout the latter half of September. This field was swept with a collecting net as late as November 4, and at no time was *E. mali* found in abundance, only a few specimens being taken at a sweeping. This is to be regarded as evidence that it does not winter in the adult or any other but the egg stage, since none were found November 4.

The above-mentioned blisters, containing fall-laid eggs, were found throughout the orchard referred to, but were apparently most numerous on the side adjoining the alfalfa field. They were most plentiful on the second and third years' growth from the present, according to Doctor Franklin's report, though he found them occasionally on the growth next to the present year's growth, and they were often found to be rather numerous on the fifth year's growth from the present. Only one egg blister which appeared to be that of *E. mali* was found on last season's growth. Distance from the ground does not appear to have the influence on the position of the egg blister which one might expect. To be sure, they seem to be more abundant on the lower branches, but the upper branches also seem to have a considerable supply; for instance, different heights were examined, and

blisters were found as high as seventeen feet and three inches from the ground. Two branches over twenty feet high were examined, but no blisters were found thereon. It seems probable that adults choose for fall laying those portions of the tree where blisters are found to be most numerous because those portions are in the condition best suited to protect the eggs and at the same time tender enough to make ovipositing easy. The newest growth is not chosen, possibly either because its bark is not dense enough to afford satisfactory protection from winter weather, or because its more rapid growth might crush the eggs. It may be said here that after the emergence of the nymph the hole which affords it exit narrows to a barely discernible horizontal slit.

2. **Oviposition During the Summer Months:** The petiole of apple and the petiole of clover have been found to be used for egg-laying during the summer. Apparently the egg is placed longitudinally in about the center of the petiole. Fig. 7 on the colored plate shows a nymph emerging from petiole of clover, as observed by us this year.

Since this insect swarms in all stages during the summer on a large variety of herbaceous plants, it seems fair to conclude that many such plants harbor summer eggs. Dahlias examined September 30 had adults and nymphs upon stem and petiole, and the minute slit-like scars above referred to were found on these plants. In 1907 Mr. Ainslie found what appeared to be similar scars on petioles of buckwheat growing in a nursery.

3. **Food Plants:** In addition to the apple and clover we find the insect in summer on plum, maple, bur-oak, black oak, thorn apple, basswood, hazel, box elder, choke cherry, sumac, European birch, cut-leaf birch, syringa, snowball, Carragana, raspberry, blackberry, beans, corn, alfalfa, sugar beets, buckwheat, dahlia, hemp, rhubarb, potatoes, different grasses, etc. Doubtless this list can be largely added to, and as pointed out above, it is more than probable that egg-laying takes place during the summer upon many of these plants. Field beans and alfalfa upon the Experiment Station grounds were both badly injured this year by *E. mali*.

4. **Different Stages and Number of Broods:** The finding of five nymphal stages in 1907 (see figures on colored plate) was corroborated by observances in 1908. An insectary experiment as to the length of life in each stage resulted in the following: First stage, three to five days; second stage, one day; third stage, six days; fourth stage, six days; fifth stage, four days, or an average of twenty-two days from egg to adult. Too much reliance must not be placed upon these data, as they are the result of one experiment only, though it is

interesting to note that the 1908 observance, as far as total time is concerned, was practically corroborated by the work of 1907, when it was found that the insect spent from nineteen to twenty-five days in nymphal stages, although Mr. Webster, in 1907, did not determine the length of time spent in each stage. Insectary observations in 1908 indicate that the adult may live at least fourteen days. Its length of life is probably much longer, for experiments in 1907 indicate that it may live more than twice that length of time. There are surely two broods of *Empoasca mali* during the season in Minnesota, and almost certainly three. It is easy to define the first two broods, which are fairly well separated. Allowing forty days for each cycle, which seems a fair estimate from the data we have at hand, and bearing in mind that they first appear about May 25 (1907), or soon after the leaves open, we would have, in round numbers, one hundred and twenty days, to September 25 (at about which time adults grew appreciably less in numbers), permitting of three such cycles. This estimate is, necessarily, crude.

5. **Economic Suggestions:** Though the leaf hopper is found in abundance on trees in apple orchards, the most and perhaps the only serious results of its work along commercial lines are on nursery stock. As remarked by a very large grower in our state, "the trade requires a nursery tree between five and six feet high. This standard could be reached in three years if it were not for the leaf hopper, which so retards the growth of nursery stock that we cannot market a tree until it is four years old." This statement is generally true for Minnesota (though there are years when the hopper is not so numerous and some localities where it is not particularly troublesome). The nursery of the above grower happens to be one of the worst afflicted nurseries in the state in this connection. Since the winter egg is laid on the apple, it would appear that one means of lessening the attack on nursery stock, or at least delaying the attack, would be to locate said stock at a distance from apple orchards. Secondly, though this is by no means so feasible, to locate nurseries as far as possible from other growths which serve as food plants during the summer. This suggestion naturally includes the keeping of nursery ground free from grasses and weeds which harbor Empoasca during the summer. If, in connection with this partial isolation of nursery stock, a grower uses Bordeaux frequently (as he might for plant diseases), it would seem that it might act in a measure as a repellent.

In order to kill a large proportion of the first brood, it is desirable to collect the adults with some form of hopper dozer, sticky

shields, for instance, every day for a week at the time they first appear. We have made use of sticky shields with good results. A light frame was made three by four feet, with handles, covered with heavy cloth, and smeared with tree tanglefoot. A thinner grade of tanglefoot than this might have been used advantageously. Two men were employed in this work, one man holding the frame and walking down one side of the row of trees, while the second jarred the trees from the other side. Two men in ten minutes covered two hundred and ninety feet in a row, and an actual count of hoppers caught in the ten minutes was 3,221. About 95 per cent of these were adults.

Spraying the trees with any compound does not seem advisable, on account of the difficulty of hitting the insects in the curled leaves, but we found that a spray of one pound of fish-oil soap in ten gallons of water killed both adults and young, when not too well concealed in the leaves.

For use on experimental plots, we constructed a hopper dozer, with a metal pan to hold petroleum. By once employing this on alfalfa plants we believe we killed nearly 50 per cent of the insects present at that time, and it would seem that it could be used to advantage on a commercial scale with any low-growing plants set in rows.

PRESIDENT FORBES: Discussion is next.

MR. R. L. WEBSTER: Mr. President, I would like to make a few remarks on the number of broods, comparing Minnesota conditions with Iowa conditions. I see Professor Washburn has succeeded in getting only three broods. I have pretty conclusive evidence that in Iowa we have five broods. That is, at the rate of one brood for every month. About once a month, I think it is the last few days of one month and the first few days of the next, they appear on the young tender shoots on apple stock, as shown by the curling leaves, which is coincident with the appearance of the newly hatched insects. The leaves first come out in southern Iowa about the latter part of April, and with them appears the first brood of young leaf hoppers. The insect winters in the egg stage, as it does in Minnesota. Counting one brood a month, by the first of September we have five broods, and the winter eggs are deposited in the bark about the first week in October. I found them at Charles City, about the sixth of October, thus making five broods.

MR. WASHBURN: It is very strange that we found clusters on the 23d of September. I don't know why we should. Of course, being further north, they would begin laying their eggs sooner. This was at St. Anthony Park.

A MEMBER: I would like to ask Professor Washburn if these insects are attracted by light and whether that can be made use of. Can they be attracted by gasoline torches at night? I have noticed that some species are attracted by light.

MR. WASHBURN: That opens up an interesting question. I don't know.

MR. SMITH: Mr. Chairman, I know that this particular species is very strongly attracted to light, but I don't think that is true of the grape leaf-hopper.

PRESIDENT FORBES: If there is nothing further, we will take up the next subject: "Do We Need the Insectary?"—a general discussion to be opened by Mr. E. D. Sanderson.

DO WE NEED THE INSECTARY?

MR. SANDERSON: Mr. President, I have not prepared a paper. I brought up the subject because I wanted to hear a discussion and wished to get the views of some of those present upon the matter. In my own training, I came to believe that I must have an insectary. I have been trying to get one at every place I have been, and have never succeeded, but I have managed to get along without one. The more breeding I have done indoors and compared with records made out of doors, the more I have found that there was considerable difference in the life histories which were obtained by breeding indoors from those secured out of doors. In looking at insectaries at different places in the country, I very often found them practically out of use. In the summertime they are too hot. It is very difficult to grow things. In the wintertime there is very little work going on. There is very little occasion for using a heated insectary in winter, unless a man is engaged in special investigation on something that can be bred during the winter. In studying the work of the Gypsy Moth Parasite Laboratory, I was very much impressed with their outfit for rearing insects. Most of you are familiar with it from Mr. Burgess' description in the JOURNAL OF ECONOMIC ENTOMOLOGY, and many of you have seen it. The house consists simply of a frame set directly on the ground with wire screening on the sides and a canvas top. The cages for rearing Carabid beetles are set in the ground and trays are used for rearing caterpillars. In the fall the insect material can be removed if desired, and the house stripped for the winter. I believe this outfit is in a process of evolution. It has a considerable history, if I am not mistaken, for I know that large cages have been used in the field for several years by various workers. I have been wondering whether it would not be better for us

to use an outfit like this, making it something on the order of a small greenhouse; possibly in sections, with simple wire sides and screens, and with top of canvas or of prepared roofing, such as is used for sky-lights. This will give us just about as near outside conditions of temperature and moisture as possible. Would it not serve every purpose of the insectary and even be better than the glass house? I think it is a question which will bear considerable discussion. I have been considering building such a house for our work out of doors, and I should like to hear the experience of those here, particularly those in the Bureau of Entomology, where they have used such a house, and also from the men who have had experience with the insectary, as to whether it is absolutely necessary that we have the insectary, since it is a matter of considerable importance and one which, so far as I know, has not been much discussed in recent years.

MR. BURGESS: Mr. President, since Professor Sanderson has mentioned the breeding outfit at the Gypsy Moth Laboratory, I want to pass around a photograph of the house in which we breed beetles; the one which he has described. This photograph was taken last summer. The house was constructed with the idea of giving natural conditions for rearing predaceous beetles which are being imported from Europe to prey upon the gypsy moth. The canvas top was removed this fall and we now have a large number of beetles in hibernation in the wire cages set in the house.

MR. SLINGERLAND: Mr. President, I was brought up in the first insectary ever built. I have always lived there, and want to continue to do so. It may be that we can do as good work in a cloth insectary, but I want a house that will hold the wind off. I want it for insect photography, for we need more careful details in our photographs. The out-of-door house is all right, and we want that too, but I am still content to live in the first insectary,—the glass house.

MR. WEBSTER: Mr. President, I have been wondering all the time why Professor Sanderson didn't put his question the other way,—"Can you get along without an insectary?" An insectary is a means, and not an end. That is to say, it enables us to get results at short range, that could by no possibility be obtained in any other way. We have field cages scattered nearly all over the country; that is one part of the investigation. Something new appears in the fall, and, with an insectary, it is possible to run it through and get an outline of the history of the insect before spring, when we can take it up in the field and simply use the information got through the aid of the insectary as a guide.

Coming back to the matter of nomenclature again, I want to dis-

inguish between "breeding" and "rearing." We are doing a great leal of breeding, generation after generation, the offspring of perhaps one pair, and there is no way that we can do that out of doors. You have got to have some place where you can follow the little reatures, almost microscopic, and breed the progeny through the different hosts. We can't follow out matters like parthenogenesis and polyembryony in the field or study a great many of the more minute points under field conditions.

MR. F. L. WASHBURN: Mr. President, it is not right to throw stones when you live in a glass house, but it seems to me that the statement of Professor Sanderson reminds us of the fox and the grapes. He has no insectary, and we have. We have an insectary, and in our cold room the conditions are just the same as outside during winter, fall, and spring. We can control the insect so that we can observe it, which we cannot do if we depend upon outside work.

MR. BRUNER: The persons who have been talking up to this time have spoken entirely on the experimental side of the work. From the standpoint of the teacher, I believe an insectary is indispensable. You have your students in the fall, winter and early spring, when outdoor conditions do not enable them to study the life history of the insect. If you live in the West, you sometimes have insect attacks or outbreaks three, four or five hundred miles away from headquarters, and you must have an opportunity to bring the insects in to study and rear them under observation. The insectary in both of these cases is absolutely necessary.

MR. J. B. SMITH: I do find that when it comes to the question of merely observing the life history of an insect and trying practical methods for its extermination, I can do better in the field than I can indoors or in an insectary. For certain kinds of research work, an insectary, I can conceive, is absolutely indispensable. For mere economic work and for ascertaining means for insect control, I don't think the insectary is necessary. I started out with the idea that I wanted one the worst way, and for five or six years I worked very hard to get one, but I did not succeed, and I finally concluded that I did not want one. I have none at the present time, and I get along just as well without it. On the other hand, I do not do a great deal of the kind of work that requires close attention, and "breeding," as Professor Webster defines it. If I were doing work of that kind, I should feel that it was absolutely necessary.

MR. H. T. FERNALD: Mr. President, I think Professor Smith has, in a way, struck to the root of the matter. Everything depends upon the subject upon which you are at work. I have come to feel the

necessity for an insectary, because such an amount of work in Massachusetts is related to the growing of greenhouse crops. There is a large amount of crop raising under glass in that state, and the insects are particularly abundant on house-raised crops. For such cases as that, insectary conditions are not abnormal, but entirely normal, and, therefore, an insectary or a greenhouse, where you can raise the very crops that are being raised in the forcing houses in the state and apply methods of control to the insects on those crops, is just what you want. If it were out-of-door insects, I should favor the method made use of at the Gypsy Moth Laboratory. I would very much object to doing without a greenhouse under my own control. On the other hand, there are many months, perhaps, in each year, during which I may have no use whatever for that house. It simply amounts to this. When I do not want the insectary greenhouse, I do not want it at all, and when I want it, I must have it.

A. D. HOPKINS: Mr. President, Mr. Fernald has just covered part of the remarks I was going to make, that the character of work will determine the kind of insectary. I may say, that in our forest insect work, we have very little use for a glass house insectary. We do need lots of glass, tin cans, tin boxes and paraphernalia of that kind, which are extremely useful in rearing insects from wood and bark.

MR. TITUS: Mr. President, I want to emphasize Professor Bruner's point, and that is in regard to the distance some of us have to travel. Now, I can go from here to Ogden nearly a day quicker than I can go the length of my own state, so that when it comes to a question of handling plants that live in the southern part of Utah, which do not grow in the northern part of the state, we need a greenhouse in order to have these plants growing, so that when the insects come in we will have something to feed them on, as we never could secure them under ordinary out-of-door conditions.

MR. JONES: Mr. President, I would like to pass around some photographs of the type of breeding house that has been used for the last four or five years by the Bureau of Entomology in rearing deciduous fruit insects. Briefly described, it is a shed with a roof covered with shingles or tar paper and with sides of wire screen, such as is used for fencing chicken yards. The interior is provided with shelves to accommodate jars and breeding cages and in the center is a table for similar use. The floor is made of earth, and in it cylinders and flower pots are placed containing insects which pass a part of their development in the ground. This type of house is used at all of our field stations for miscellaneous breeding work. Special devices often have to be made for investigating special insects.

MR. GOSSARD: When I was located at the Florida station, I think we hardly needed an insectary, except large wire cages or something of that description.

I agree that an insectary is, at least, a great convenience at times, and either that or a building of some kind is a necessity. I believe the insectary is useful, but it should not be relied upon too much. In other words, you cannot depend upon results that you get in a greenhouse for out-of-door conclusions. I like, when I am working upon life histories, to have cages in the insectary, because you can isolate your insects, and if they, as they nearly always do, come out a few days earlier, it gives you warning to look for them outside. A great amount of glass I do not think is needful. At the same time, we have a large greenhouse at the Ohio station, and there have been times when I have had it completely filled. Again, it would be vacant for six months at a time.

E. D. SANDERSON: Mr. Chairman, I may have misstated this question. It should have been possibly, "Do we need a glass insectary?" There seems to be a difference of opinion on that point. I think Professor Bruner's point about the desirability of a glass insectary for instruction work is a good one, but it seems to me that there is quite a question whether a more open insectary, giving more natural conditions than the glass house, is not better for breeding purposes. As far as parasites are concerned, they are handling as many parasites at Melrose Highlands as any place, and I don't believe that you can get life histories that are worth anything in a glass house when you check them up with what you actually find out of doors. What is the use of making lengthy life history studies which we know do not take place out of doors? We certainly do want a glass insectary for some classes of work, but it does seem to me that we have done a great deal of life history work in glass houses, and if we had checked up carefully, we would have found a good deal of difference between what occurs there and out of doors.

MR. SLINGERLAND: Mr. President, I must object to some of these points. I don't think my indoor life histories are so very much different from those secured out of doors, and the indoor work gives me experience that helps a good deal out of doors.

MR. HINDS: Mr. President, the remarks made have been very interesting to me, because we have that question under consideration; that is the establishment of an insectary. I have been very much interested in the plans of Mr. Woodworth, of California, for he is going to have an open court, walled in and a roof to cover a part of the court, so that in rainy weather he can examine the specimens un-

der cover and at other times examine them in the open court. I wonder if it wouldn't be a good thing to compromise and have the glass insectary with the extension, with a sort of an open court partly roofed. Our president has put several thousands of dollars into an insectary, and it might be a good idea to hear his experience.

PRESIDENT FORBES: I must say so far as my observation has gone, it would accord with what has been said by Professor Slingerland. I think if proper ventilation of the insectary is looked out for, and proper screening of glass windows exposed to the sun, and proper temperature records of indoor and out-of-door situations are kept parallel with each other, that there is no reason why indoor results should differ from the out-of-door results. We used to keep within two or three degrees of the out-of-door temperature by having the roof open at the peak and the sides. I don't think it averaged more than a fraction of a degree in the twenty-four hours between the inside and outside. Still, there is a vast amount of work in the ordinary entomological office which I think can be done as well in the cheap temporary construction which has been described, and can possibly be done with more security and less expense. I don't know that I have done more than to sum up this discussion in a general way.

MR. COOLEY: It seems to me that when we publish life histories, we should publish with the life history the temperature records of the room in which the studies were made, in order that others who wish to interpret the results may have the same advantages we have had. In a paper on ticks which I have just submitted for publication, I have given both the temperature and humidity records.

METHODS OF REARING WHITE GRUBS

PRESIDENT FORBES: While we have this subject up, I would like to make an inquiry upon a matter on which I need help. I am doing some difficult breeding work without an insectary, although I have an insectary also. I am attempting, I believe, for the first time anywhere in this country, to carry through an extensive series of breeding operations upon our American species of Lachnosterna. We have five "bug farms," the people call them, in different parts of the State of Illinois, two in southern Illinois, one in the central, and two in the northern part of the state, each of them consisting of a group of forty-eight tile, most of which are two feet in diameter and sunk in the earth to their full depth, except in northern Illinois, where they are sunk in the earth in a double row, and at the bottom of each of these tiles is a layer of either gravel or broken tile. The tile was filled with earth, packed discreetly, and upon this was put a layer of turf, and

the whole was covered with a conical cap, and the various species were deposited beneath that. They were kept there with the hope and expectation that eggs would be deposited from which the larvæ would hatch, and that we would be able to work out the life history of each of these species independently through whatever period might be necessary, and do it in the different parts of the state, so that we should get whatever variations of the life cycle the differences in temperature in our state might involve. But certain difficulties have arisen, and I would like to know if any of you have tried any similar experiments and know whether there is any method of meeting these difficulties. We had an extreme drought during all the latter part of the summer season, and the tiles dried out to the bottom and did not become wet again. The core of earth baked hard and shrank away from the tile on all sides, which exposed it to the sun and allowed it to bake like a solid cake which could be moved about. I have supposed, and it has been suggested to me, that we had "broken the connection," as they say between the soil water and the water in the tile to such an extent that the water which should have risen up in the tile did not do so because of a layer of air in the gravel or broken tile. Now, I would hardly put a question of this kind if we didn't have plenty of time and, in the second place, because it is a piece of work which, so far as I know, no one else is undertaking, unless the United States department may have taken it up this year, and I feel, consequently, that I am undertaking a piece of work that we are all interested in, and if I carry it through, you will not have to do so.

MR. WASHBURN: Mr. Chairman, couldn't you use a variety of very fine gauze, wire gauze, for your cylinder, that wouldn't interrupt the moisture?

PRESIDENT FORBES: I have supposed that the wire gauze wouldn't last for the length of time we supposed it would be necessary to maintain this experiment.

MR. MARLATT: I was going to suggest that a bronze wire might meet the need; such as the best grade of bronze wire now used in houses. I fancy that that would be fairly durable, and, by making a cylinder with it, it might work.

Another idea occurred to me, based on the experience with breeding the Cicada. You remember that half a dozen or more attempts were made to carry the Cicada through, all failing, except the last, on account of the lack of abundance of material. It occurred to me that perhaps that method could be adopted in your work, namely, surrounding a large area, say, several yards, or even a rod, in diameter, with a net, in which you can enclose fifty, or a hundred, or a thou-

sand beetles, if necessary. They would deposit eggs under absolutely natural conditions, and the area would become heavily stocked with the one species.

SECRETARY BURGESS: Mr. President, in attempting to hibernate Calosoma beetles, I had the same difficulty last winter that you have had with the ground drying out inside the cylinders. I used galvanized iron cylinders, two feet in length, and, fortunately, I experimented at the same time with galvanized iron wire cylinders, which worked all right. I doubt, though, if that material would stand for the length of time required in your experiment, but the beetles came through very nicely in wire cages, whereas in a solid galvanized iron cage the soil packed so badly that nearly all of them died.

A MEMBER: Mr. President, may I ask if you used glazed tile?

PRESIDENT FORBES: No; porous tile.

MR. HOPKINS: Perhaps you will find that some of the larvæ will not live as long as has been supposed, and that some of the beetles may emerge a year ahead of others. It had been supposed that the so-called sawyer beetle lived two years before transforming to the adult, but in some observations made by my field men in the South, it was shown they developed from the egg to the adult in three months, and apparently from the same lot of eggs, some larvæ would go over to the next year, and it is possible that some may go over two years, so it is very evident that we need a lot of careful observations on a good many of these things.

MR. SYMONS: Mr. President, I would like to inquire how the gravel, etc., was arranged at the bottom of the tile?

PRESIDENT FORBES: The object in putting material in the bottom of the tile was to prevent an accident which happened sometime before. That is, to prevent the grubs burrowing below the end of the tile and making their escape. We wanted to imprison them, and that is why we put it in. It was a very thin layer, just enough to make sure that the grubs would not go through it.

MR. SYMONS: I thought that by extending that surface of the gravel outside the bottom of the tile the moisture might go up more readily.

A MEMBER: Mr. President, perhaps if you had some method of irrigating the soil, it would work all right. This might be accomplished by putting in two or three tubes.

After the transaction of routine business the session adjourned.

[The above comprises all of the proceedings ready for publication.—ED.]

(To be continued in the next issue.)

THE CALYX CUP MUST BE FILLED*

By A. L. MELANDER, *Pullman, Washington.*

In the June, 1908, issue of this Journal there appeared an article on codling moth spraying, entitled "Filling the Calyx Cup." The style of this article was purposely made assertive and accusing in an effort to arouse Eastern entomologists, by its extreme causticity, to try out in the orchard the treatment which has proved successful in the Pacific Northwest. Copies of this article and Washington Popular Bulletin 5, giving detailed descriptions of codling moth spraying, were circulated among official entomologists and horticulturists. Naturally a radical departure from customary methods stirred up many objections, which have come to us in letters and through the press. A symposium of the objections will certainly interest the student of the codling moth, especially since it is contributed entirely by officials.

The Western method aims simply to place poison beneath the stamens. This can best be done by throwing a driving spray through Bordeaux nozzles, at a pressure approximating 200 pounds. Most of the spraying is done from a raised platform, and a crook is used at the end of the rod to direct the spray downward. The spray must be thrown squarely into every blossom for success. A dilute spray of one pound of arsenate of lead to fifty gallons of water copiously applied is more conducive to thoroughness than is a sparing use of a concentrated wash. One such application destroys the first brood and thus actually insures practically 100% of clean fruit. Thus there is no need for later applications. In addition to assuring thoroughness, high pressure means rapid work, thus reducing the labor-cost. The weak formula saves quite an item. The absence of late generations of worms eliminates disfiguring "stings," which always result when late larvæ have to be destroyed by late surface applications. The single application leaves time for other orchard work after midsummer. Irrigation is not interfered with, as the orchard does not have to be dried out to permit the passage of the spray outfit. There is no damage to apple-laden branches, low hanging because of their weight of fruit, from driving a spray wagon through the closely-planted orchard. Moreover, for oily skinned and glaucous varieties it is the only method that can be successfully used.

A single thorough spraying has afforded practically 100% returns over hundreds and hundreds of acres of Washington orchards. The

*Contribution from the ZOOLOGICAL LABORATORY of the STATE COLLEGE OF WASHINGTON.

same benefit from the single spray has also been abundantly attained in Colorado and Utah. The single spray is obviously the most economical treatment for the codling moth, and as it has proven decidedly the most efficient it deserves the attention of Eastern entomologists. The various objections have therefore been collated and answered, in hopes that the field worker will not be deterred from giving the method a fair practical test.

Finally, I wish to repeat that this article and the one which preceded it were not written to antagonize my fellow-workers. The two were prepared for their benefit, and while the method of arousing attention may lack diplomacy, I hope that the outcome a few years from now will cause an appreciation of the better motives prompting the assertions and accusations to overshadow any present unpleasantness. There will be hundreds of Eastern fruit growers who will follow the Western method of spraying this year; and they will have success. The professional entomologist may as well keep pace, and accept credit for the movement, for the change in the methods of codling moth spraying is bound to come.

1. *"Theoretically the single spray is all that is necessary, provided you have only one variety to deal with, so that all the fruit reaches the same stage at the same time. Our orchards do not equal in extent those of Washington, and we have very few orchards with only a single variety. An apple orchard of three or four hundred trees may contain half a dozen varieties, and the date of blooming between the earliest and the latest may extend for nearly two weeks."*

This published objection comes from a state of one-tenth the area of Washington, yet which contains two-thirds as many trees as we have. In our apple districts the usual ranch comprises from five to ten acres. The orchard of twenty acres is the exception. Moreover, these orchards are planted to just as many varieties as are usually found elsewhere. I know of no orchard set out to one or two varieties exclusively. Although Mr. McInnis, of White Salmon, lost 50% of his crop in 1907, one spraying of his mixed orchard of thirty-five varieties raised his 1908 crop to 99% clean. Mr. Heidenhain of Wenatchee has a house orchard of ten varieties that lost 25% to the codling moth in 1907. This year he sprayed all the trees once, on one day, and changed his returns to a total loss of one-twenty-fifth of one per cent. To get above the trees he used a step ladder. He used a hand pump, one Bordeaux nozzle, and kept the pressure at 150 pounds. Mike Horan of Wenatchee sprayed his twelve varieties but once after personally studying our spraying. He lost 15

boxes to the worms, but his 8,000 boxes of sound fruit were of such condition that a carload selection took the premier prize of $1,000 at the National Apple Show.

Our own college orchard of thirty acres contains six hundred varieties, yet we go over it only twice to insure a thorough first spraying, giving each tree, however, but one application. This orchard was neglected for some years and in 1906 was 40% wormy. Three applications in 1907, two for the first and one for the second brood, changed this mixed orchard to 99.9% clean.

Bulletin 299 of the Geneva, New York, Station lists the blooming periods of 278 varieties of apples for New York. One spraying given about June 1st would answer for an orchard having all these trees.

2. *"Our weather conditions are not nearly so uniform as yours, and on the same tree we may have well set apples and unopened buds. No one spraying will hit all the fruits that are to be protected."*

This objection comes from several localities, both on the Pacific and Atlantic slopes. It is probably universally true that all blossoms on a tree do not mature together. Our spraying is timed for the flowers that will set fruit, and not for the ones that will be thinned off by crowding or picking. The center flowers are always in advance of the others of the cluster, and these are the ones that normally set fruit. Lateral buds do not produce fruit worth the attention of the commercial orchardist, but if it is desired to spray for these there is no objection to "touching up" a tree, as is usually done for scale insects.

3. *"Oviposition is too irregular, both in time and place of egg-laying, to depend on spraying for the calyx alone. Since eighty per cent of the eggs are laid on the leaves I consider the covering of the foliage the most important part of the work."*

A practical answer to this comes from our spraying experiments. In 1907 unsprayed trees used as checks in the orchard were 52% clean. Those trees that were not given the first spraying but which received three subsequent applications produced also 52% of worm-free fruit. Where the first spraying was also given the results were changed to 98%. This season a block of trees was given a single application when the first brood larvæ were just entering the fruit. The worminess was exactly the same as the unsprayed check trees. The adjoining trees that had also a single application, but given a month before, were 99.92% clean. Other similar cases could be cited

to show that although theoretically desirable, spraying the foliage gives no practical benefit.

4. "Our apples attain a surprisingly large size before the first brood of larvæ begin to enter the fruit. Thus a large part of the surface will be unprotected by the poison."

Coming to Washington with the idea that the second spraying should follow ten days after the first we were surprised to note that the onset of the first brood of worms occurs from a month to seven weeks after blossoming time, and of course by that time Washington apples are also surprisingly large. But that point has little to do with the validity of calyx spraying, for, by the time of the third brood, apples are still larger, yet the first spraying gives just as much protection then as ever. The average of all our counts in unsprayed orchards shows 90% of the late larvæ entering through the calyx. Theoretically, therefore, spraying the calyx alone should destroy 90% of all codling moth larvæ. Practically, however, probably because of the natural mortality of the insect, the number is nearly 100%.

5. "In every case where the young larva had entered the apple at the calyx end it had stopped to feed in the outer calyx cavity. I was unable to obtain any evidence that the larvæ worked their way into the lower calyx cavity without first taking several meals in the outer cavity."

Undoubtedly some larvæ do feed in the outer cavity, but that is not the point. The important fact remains that some larvæ take their first meal in the lowermost cavity, and in the matter of practical spraying our main attention must be directed to them if we are to exterminate the first brood. When poison is forced into the lower calyx cup there is enough in the outer cup and on the leaves to take care of whatever larvæ may choose to feed there. But when a mist-spray is used for the outer cavity alone, some larvæ, a great many even, reach the lower cavity unpoisoned, and then we cannot hope for 100% of success with one—or even more than one—spraying. The western method aims to reach the most inaccessible part of the flower. Only by that method can one spraying be depended on under the adverse conditions prevailing in this three-brooded district.

Director Ball* has already pointed out that "an examination of thousands of apples with this point in view showed that in 97% or 98% of those classed as 'calyx wormy' the entrance had been made from the lower part of the lower cup." Our own observations cor-

*U. S. Bur. Ent. Bul. 67, p. 74.

roborate this statement. It is impossible to believe that the codling moth in the East departs entirely from this habit. The number of larvæ taking their first meal in the lower cavity is probably much less than 97%, but from the large number of dead larvæ found beneath the stamens on sprayed fruit, their diminutive size showing that death occurred during the first instar, it is evident that spraying must be so done as to protect the lowermost cup. We have observed as many as a dozen dead larvæ of the first instar below the stamens of a single apple. The tree from which this fruit came was next to a packing shed where 2,000 boxes of wormy fruit had been culled and dumped, yet that tree, as well as all those near by, was kept 99.9% clean. It is safe to say that such protection could not have been given if the lower cavity had not been reached by the spray. In previous years these trees had been losing three fourths of their crop, though heavily Vermorel-sprayed with concentrated arsenate of lead.

That the larva should be directed to the lower cavity is not strange, for even in our ignorance of the tropisms of the codling moth, we must appreciate that the nectaries are located here, that the epidermis beneath the stamens is much thinner than in the outer cavity, where in the mature fruit it becomes even woody, and that a hiding larva will seek the end of a retreat. Certainly the odor at the calyx end is more intensive, even to our perceptions, than that emanating from the other parts of the apple.

6. *"I am informed that at the proper time for the first spraying there is very little rain at Wenatchee to wash off the poison. It is, of course, useless to spray during a rain. A prolonged rainy spell at the first spraying is a serious matter, for it interferes with the timely application of the poison."*

Mr. H. E. Bacon has at Evergreen an orchard of thirty-six acres, with about as many varieties. In 1907 this place was sprayed six times with Vermorel nozzles and lost 40% of its crop. This year it was sprayed once under our direction. During a part of the time it rained, yet that had no appreciable effect and the entire orchard yielded over 99% of worm-free fruit.

Almost every year it has rained before the first spraying was completed, in some cases accompanied by a driving wind storm. Nevertheless our spraying has not been interrupted. That there has been no need of waiting for more pleasant weather is apparent at picking time from the results as perfect from the plots sprayed during the rain as elsewhere. In these cases, which have been carefully watched, almost the entire protection to the flower was the poison forced be-

neath the stamens. The outer calyx cup was washed free of spray by the rain, which of course could not penetrate below, like our spray driven at 200 pounds.

7. "I would also call your attention to another point, which perhaps is not familiar to you, and that is, that in some of our varieties it is simply impossible to get the poison down to the bottom of the calyx cup, because of the apple formation itself."

Professor W. S. Thornber, horticulturist at the Washington Experiment Station, has devoted many years to a comparative study of the apple blossom, both in the Atlantic and the Pacific regions, and he assures us that microscopic measurements show no differences in structure induced by the change in environment. We have sprayed nearly one thousand varieties of apples with unquestioned success, and have yet noticed none of such conformation that the lower calyx could not be effectively sprayed.

It is true that the stamens are turgid and woolly and crowd against the pistil, forming a tight barrier against a misty spray, but their diverging free ends make a funnel-throat readily forced open by a pressure-driven coarse spray, if that be squarely directed against the flower, to spring shut again and enclose a drop of the liquid. This probably is the secret why arsenate of lead will serve when used as weak as one pound to eighty gallons, or probably even much less, for the drop carries with it enough poison amply to coat the interior of the cavity when evaporated. Our criterion of thoroughness during the first spraying is to section flowers picked at random to see if the lower cup is filled with liquid. If any flowers are found dry beneath the stamens of course the spraying is imperfect, and 100% returns can not be expected from the single spraying. However, the lower cup is always full when the tower-crook-Bordeaux nozzle, 200-pound pressure method is used.

8. "If I ran the pressure up, the blossoms capsized from the force of the spray, and still the spray did not get into the lower cavity."

A pressure-driven spray directed squarely will invariably be forced past the stamens before the flower has a chance to tip over. Vermorel nozzles, which throw a hollow cone of spray, rarely strike the blossoms squarely, and therefore even if coarse are not capable of filling all the lower cups. When Bordeaux spraying is done from the ground the flowers are hit from the side and are thrown over by the force of the spray without being effectively filled.

9. "Most of our orchardists use too coarse a spray anyway and one

hesitates to advise them to make it any coarser. They will not buy more than one nozzle for all their sprayings and to speak of making that a little coarse would be almost heresy in our state, since they would use this coarse nozzle for all purposes and it would eat up more liquid and would discourage some of them from spraying at all. It does not take much to discourage them anyway during the last two or three years."

A coarse nozzle does not mean a drilled-out Vermorel. It must be of the Bordeaux type, where the force of the liquid is not spent on leaving the orifice. Such a nozzle is not wasteful, but effective. It is the type used almost exclusively in this region, and it is used for all kinds of spraying. It does not miss the object aimed at, like the Vermorel, but shoots a penetrating, effective sheet of spray, filling all the blossoms in its path to a distance of eight or ten feet from the nozzle. Moreover, since the main cost of spraying is labor, a nozzle that throws nearly three gallons per minute is more economical than a battery of Vermorels distributing one half as much spray. A single Bordeaux nozzle is all that a hand-pump can maintain at above 150 pounds pressure. A power sprayer can supply four.

10. *"The one point that I take such exception to is the weak spray of one pound of arsenate of lead to fifty gallons of water. In all my experiments I find that less than two and one-half pounds to fifty gallons will not suffice to kill all the worms."*

While we use and recommend one pound of the arsenical to every fifty gallons, a block of trees sprayed one pound to eighty gallons yielded us 99.92% of worm-free fruit. These same trees were over 50% wormy the year before when given Vermorel sprayings of three pounds to fifty gallons. It is not the formula that is important, but the method of application.

11. *"Fruit trees are being poisoned and killed by excessive use of poisons. The heavy drenching of trees is therefore a dangerous procedure."*

The enigmatical disease occurs in Washington, but is prevalent in neglected, little-sprayed orchards as well as in those over-sprayed. But, granting the danger of arsenical poisoning, it is but another point in favor of the single spray. "Drenching the trees" is not a happy description of the western method of spraying. Each blossom is filled or drenched, but the driving spray can be so accurately apportioned that there need be little drip from the tree. To be certain of thoroughness most growers overspray and thus drench the

trees, so that the ground beneath may be damp. In general one gallon of spray suffices for about two bushels of expected fruit. The amount of spray that each blossom can hold is limited, so that with a little watchfulness there need be no waste of spray material. Another point not to be neglected is that our spray contains one pound of arsenate of lead to fifty to eighty gallons, which is about one third the strength usually used. While we may apply more gallons per tree, the total amount of arsenic used is less than when the concentrated misty spray is employed.

12. "Are not the good western results due more to thoroughness than to the 200 pounds of pressure which is supposed to be necessary to drive the spray into the lower calyx cavity?"

A high pressure is first of all conducive to thoroughness. There is little chance of missing blossoms with a broad sweeping stream. In the case of the badly infested Breese-Johnson orchard at Wenatchee, six acres were sprayed at 240 pounds pressure, and two acres at 140 pounds. The six acres lost but one third of one per cent; the portion sprayed at low pressure lost 3%. At 200 pounds pressure practically twice as much spray leaves the nozzle as at 100 pounds. The spraying consumes but one half the time. With western labor at $2.50 per day, and the period of spraying limited to the closing of the sepals, the time element in spraying is an important factor. A coarse spray at 80 or 100 pounds can force the stamens and fill the lower cup, but its effective range is limited and therefore every branch must receive individual attention. A moment's comparison in the field between the western and eastern methods of applying spray has instantly converted every fruit grower to the high efficiency spray. No adequate idea of the effectiveness and rapidity of a downward directed, pressure-driven Bordeaux spraying can be formed by guessing in the office or laboratory.

Washington fruit growers have not been slow to appreciate the economy of power spraying. In 1908 over one hundred fifty high pressure gasoline power outfits were sold in Eastern Washington alone, probably four times as many as were sold in any one state in the Middle West. And yet the ten states between Nebraska, Arkansas and Ohio contain more than one half of all the apple trees grown in the United States, while Eastern Washington has but 1%. In commenting on this fact, Editor J. M. Irvine of the *Fruit Grower* asks: "Is it not likely that this is one reason why our northwestern friends are able to guarantee absolutely every apple in the box, while most of the growers of the Middle West are clamoring for a 'straight pack.'

'orchard run,' and other forms of grading which will take the wormy, scabby apples with the sound fruit?"

13. *"Spraying for the first brood alone could not successfully be depended upon in a very wormy orchard, nor where the orchard is surrounded by infested trees."*

P. Sanger bought an old orchard at Toppenish that produced 150 boxes of salable fruit in 1907. He sprayed it three times for the first brood in 1908 and packed out 9,000 boxes. The orchard was made 97% clean, a decided change from practically 100% wormy, by careful spraying for the first brood alone. The results should have been practically 100% clean, but a 10% calyx infestation of his wormy fruit indicated a faulty application of the first spraying.

The Breese-Johnson tract at Wenatchee, which lost over half of its fruit in 1907, was certainly a wormy orchard. In 1908 a part of this was sprayed twice and a part once for the first brood and the crop was rendered 99% clean. The second spraying gave no appreciable benefit, not enough to pay for its application, and there were no calyx wormy apples. The Blue Pearmains of this orchard were 90% wormy in 1907, when they had been given four Vermorel sprayings. One Bordeaux spraying in 1908 changed the fruit of these trees to 93% clean. The King apples were 85% wormy in 1907. The one spray of 1908, filling the lower cups, changed the loss to less than 3%.

H. E. Bacon has a 35-acre orchard at Evergreen which lost 40% of its crop when Vermorel sprayed. In 1908 it was sprayed once under our direction and the loss was reduced to less than 1%. Mayor McInnis of White Salmon lost half of his crop of 1907. In 1908 one spraying saved 99%. Doctor Hedger of Kiona lost every pear to the worms in 1907. Then in 1908 he sprayed once and his record was one wormy pear to three hundred boxes.

Such cases could be further enumerated, but these show that spraying for the first brood is not only practical in the badly-infested orchard, but that it is the only method that will succeed.

These same instances will give the answer to the objection made by an eastern entomologist that he would "be afraid to rely on a single spraying during some of the bad seasons, since most of the actual injury in the East here is done by the second brood." That is the very time that emphasis should be placed on spraying for the first brood.

As to the danger from outside infection, we have for some time felt that it is overestimated, when good spraying is done. In a forthcoming bulletin will be given the worminess tree by tree in an orchard ad-

jacent to an unsprayed block of trees. Even those trees next to th unsprayed portion did not become contaminated enough to warran more than the single spraying they were given.

The Breese-Johnson tract directly adjoins an orchard that was 75% wormy in 1907. The trees adjacent to this wormy orchard are th Kings just cited, which we sprayed once in 1908. The owner of th infested orchard also sprayed and had 25% of loss last season, but th previous and present worminess of his orchard had no appreciabl effect on the trees adjoining.

14. "Cannot just as satisfactory results be obtained with Paris green or arsenate of lead applied as a fine mist in moderate quantities over the trees, at about 100 pounds pressure, if the spray is directed down into the open outer calyx cavities? I have not seen sufficient evidence to warrant entomologists in answering this question in the negative."

Z. A. Lanham of Wenatchee sprayed in just this fashion, a power sprayer at 140 pounds, Vermorel nozzles, and three pounds of arsenate of lead to fifty gallons. Even with four applications properly timed his yearly loss was 4,000 boxes, valued at $4,000. We sprayed his orchard, substituting Bordeaux nozzles at the 1:50 formula, and changed his total loss to but six boxes. This man sprayed in the old-fashioned way and paid for it at the rate of $4,000 a year. His spraying bill for labor and materials now amounts to $70 per year. With the slow mist nozzles and concentrated spray and repeated applications it used to be $350.

S. Johnson and L. H. Breese, also of Wenatchee, have an orchard tract that annually lost 60% of its fruit when Vermorel sprayed, even though a power outfit was used. This year Bordeaux nozzles were substituted, two sprayings instead of four were given and the formula was cut down to one third. The total loss for the combined tract of eight acres was one per cent. Here the substitution of Bordeaux nozzles had a money value of $3,000.

A canvass of the orchardists in the Yakima Valley made five years ago showed an average of 85% returns and the Vermorel nozzle was exclusively used. Now these same growers use the Bordeaux nozzle, and their average returns are above 95%. The abandonment of the mist spray nozzle certainly has meant a saving to the fruit growers of Washington of hundreds of thousands of dollars. And, strange to say, scarcely a Bordeaux nozzle is sold east of Colorado.

While such cases as these are extreme instances, taken where the codling moth is three-brooded and consequently capable of much

greater damage than in the North Atlantic States, they suggest however the great potential influence carried by the official entomologist. His advice *is* heeded, and unfortunately the word of the conservative laboratory professor may carry more weight than that of the man who has learned in the field.

Mist sprays seem to give success in the East, but is not their efficiency more apparent than real, due to a comparatively smaller number of larvæ? The same warmth and sunshine that gives a red cheek to our Greening apples also produces an extra brood of codling moth. It is where the codling moth does the greatest damage that the mist spray demonstrates its weak points.

15. *"I do not understand how one spraying can control the insect, when all of our experiments have been conducted in such a way as to make the first spraying just as effectual as we possibly could do, many of our sprayings having been done from a platform and the tree completely drenched, and even with this, usually four sprayings have been necessary."*

This coming from a southern experiment station in one of the most important apple regions may be taken as an answer to the preceding objection. As long as our station used Vermorel nozzles or threw the spray up into the trees we deemed four sprayings necessary for our river valleys. The Idaho station has just tested the number of sprayings necessary when using Vermorel nozzles, and they get their maximum benefit of 94% with five applications. But Vermorel spraying always gives calyx wormy apples, and it is just in proportion to the number of calyx wormy apples that we find the total infestation varying. Five years ago the Yakima orchardists found 40% of their wormy fruit wormy at the calyx. They were then using Vermorel nozzles. When Bordeaux nozzles were substitued and the spraying was done from the ground the calyx infestation was reduced to about 25%. When the crook and raised platform were adopted, absolutely no apples became wormy through the calyx end. Only when calyx infestation is eliminated can one spraying be relied upon.

16. *"Our country is a large one and the differences between the Atlantic and the Pacific coasts are greater than are ordinarily believed, and this applies to plant life as well as to animal life. Because a practice has been found successful in Washington, it does not by any manner of means mean that it will be equally successful on the Atlantic coast."*

It sounds scientific and weighty and learned to assert this, but how

true is it? It was this same excuse that permitted the Pacific coast to have a monopoly of the sulphur lime wash for fifteen years. There are greater differences between the extremes of our Washington orchards where the one spray has been successful than between an average Washington orchard and one in the Atlantic region. The one spray has been used in Washington at elevations from 90 feet to 3,000 feet, with rainfall ranging from six inches to thirty inches, and where the codling moth has two broods as well as where it has three.

An outline of the western method was sent to many horticulturists, practical and official, with the request that it be given a trial. I know of no case east of Colorado where the simple details have been fully carried out. The following tests, however, though given under low pressure, are suggestive.

J. C. M. Johnson of New Wilmington, Pennsylvania, sprayed once only, with a power outfit at 80 to 100 pounds pressure, using arsenate of lead. He writes of his results as follows: "The results were excellent. My Russets, always before wormy, were beautiful and smooth and without a worm, while a small lot of trees in a field that could not be got at had the same old kind of wormy Russets. My Fallowaters showed the same benefit, and the unsprayed ones the same lot of worm holes. The Rambos were equally benefitted. My Baldwins are as near perfection as I ever saw, not a worm. Ben Davis was sprayed with the rest, and has no worms. I consider your advice was worth hundreds of dollars to me."

Mr. P. B. Powell of Clinton, New York, wrote for our spraying directions. He tested the single spray on the only low tree he had, using as much force as he could obtain from his hand pump. The crop of this tree was almost entirely free from worms, while elsewhere, where two less thorough applications were given, his fruit was appreciably injured.

Mr. J. Etna Buck had opportunity to test our suggestions for the Virginia experiment station. One coarse and weak spraying directed downward, at a pressure of 100 to 120 pounds, produced 98.81% of worm-free fruit. Two sprayings gave 98.90%. Obviously if one spraying can be made to produce such results it is not economy to give more. And we are economic entomologists.

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

In accordance with the provisions of the constitution the President has appointed the following Committee on Membership for the year 1909: Dr. H. T. Fernald, chairman, Dr. John B. Smith and Mr. W. D. Hunter.

W. E. BRITTON, *President.*
A. F. BURGESS, *Secretary.*

Scientific Notes

During the summer of 1908, various species of leaf hoppers were abundant in apple and maple plantations in nurseries. *Typhlocyba rosae* L., *Empoasca unicolor* G., and *E. mali* Le B. were common on apples, and *T. rosae*, *T. bifasciata* G. & B. and *E. mali* were also collected on maples. It should be recorded that *E. mali* was present in unusual numbers on beans, and especially on potatoes in all of the leading areas of production. On account of the abundance of this insect, many potato growers were of the opinion that this species was responsible for the early decline of the plants, which, however, was largely due to tip burn, which was widespread and very destructive. The above species were kindly identified by E. P. Van Duzee.

Punctures in bark by *Oecanthus niveus* De Geer are common on neglected apple trees about Geneva. The eggs are deposited singly and may be found in the bark of the limbs and larger branches. The eggs of *O. nigricornis* Walker are laid in linear series, and are usually abundant in raspberry canes.

Polydrosus impressifrons Gyll., an imported species and heretofore not recognized in this country, has been collected in large numbers by Mr. W. J. Schoene on willows, poplars, roses, apples and pears at Geneva and Lyons.

P. J. PARROTT.

Diestrammena marmorata in Colorado. The curious Diestrammena *marmorata* (Haan), an orthopterous insect native of Japan, has just been found in abundance in a greenhouse at Boulder, Colorado. The insect was brought to my notice by Miss Myrtle Fawcett, one of my students, who reports that it is strongly suspected of being responsible for great damage to violets. Some years ago, the same species was found in a greenhouse at Minneapolis, and on this account was figured in Lugger's work on the Orthoptera of Minnesota, p. 254. Other species of the genus are well figured by Rehn in Proc. Acad. Nat. Sci. Phila., 1906, p. 288 and 291.

T. D. A. COCKERELL.

Locust control in South America. Clippings from Montevideo papers, kindly placed at our disposal by Dr. Howard, notice a recent law in relation to locust outbreaks. There is a central committee appointed by the executive. This committee is charged with the execution of the law and is empowered to appoint departmental, sectional and district committees. The law makes it obligatory for proprietors and tenants of lands invaded by lo-

casts, to combat and destroy, at their own expense, both the flying insects and the nymphs, and to notify the authorities promptly of the date and place of oviposition. The editor of the *Montevideo Times* objects to this feature of the law, claiming that the burden on certain landlords and tenants would prove ruinous, even if the locusts did not devastate the affected section. Provision is made for the protection of certain birds. Violators of the Act are liable to fines ranging from $10 to $500. The proceeds from fines and an appropriation of $100,000 are made available for the prosecution of this work. The editor of the *Times* very wisely calls attention to the fact that this Act should be supplemented by the creation of a permanent office for the study of locusts and, in particular, for devising means for controlling these pests. There is certainly need of economic work in that section of the world.

Brown-tail moth, *Euproctis chrysorrhœa* Linn. Nurserymen and fruit growers have been considerably aroused over the reception of large numbers of seedlings from Angiers, France, bearing many nests of the brown-tail moth. These shipments were widely distributed in New York state and also sent to other parts of the country, New Jersey, Tennessee, Iowa and Missouri, at least, having been the destination of such packages. The New York State Department of Agriculture, through its inspection force, has displayed a most creditable activity in locating shipments and in insisting upon the observance of rigid precautions to prevent this insect from becoming generally established. All nests are removed from the stock and burned, all infested stock and that in boxes where nests are found, is dipped in a miscible oil diluted with 20 parts of water, and the packing and boxes destroyed by burning. A most interesting feature is the great resistance of these hibernating caterpillars. There have been a number of records of free caterpillars, that is, those not protected by nests, surviving fumigation under ordinary conditions with the usual amounts of cyanide of potassium, namely, one ounce to 100 cubic feet of space, for two hours and even for a longer period. The establishment of this pest in widely separated localities can be prevented only by the heartiest coöperation of all importers in adopting the most stringent measures for the destruction of the caterpillars.

This not altogether unexpected introduction is a very strong argument in favor of an adequate national quarantine on our eastern coast at least. The amount annually expended in New England for control of the Gypsy and Brown-tail Moths, insects which might have been easily excluded, would support such an undertaking for at least a decade.

E. P. FELT.

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The editors will thankfully receive news items and other matter likely to be of interest to subscribers. Papers will be published, so far as possible, in the order of reception. All extended contributions, at least, should be in the hands of the editor the first of the month preceding publication. Reprints of contributions may be obtained at cost. Minor line figures will be reproduced without charge, but the engraving of larger illustrations must be borne by contributors or the electrotypes supplied. The receipt of all papers will be acknowledged.—Eds.

The Baltimore meeting was a most profitable and interesting gathering. Our frontispiece shows that there was a large assemblage, including a number of veterans and most of the active entomologists of the country. There was an unrivaled opportunity to come into close touch with the latest developments in economic entomology. The program departed greatly from that of many earlier sessions. A considerable portion of the time was devoted to very profitable discussions of methods. The extended paper containing numerous detailed observations of limited general interest was conspicuous by its absence. Those who recall the tense strain necessitated by the heavily overloaded program at our last meeting in New York, most surely welcome the change. We believe that a large part of this relief is due to the possession of a publication in which longer papers can be submitted to a critical audience in much better shape than when delivered orally. Many entomologists are taking advantage of the better publication facilities and it is to be hoped that this tendency will continue, and that our meetings may be devoted more largely to the ascertaining of facts not ordinarily published, rather than to the recital of extended records belonging more properly to the printed page.

There is such a thing as over-organization. The economic entomologists, nursery inspectors, the Entomological Society of America, Section F of the American Association, and the general zoölogical organizations all have something of interest for the economic entomologist. Then, in addition, there were the affairs of the Journal Publishing Company and various other minor organizations. It was extremely difficult to meet the demands of all and at the same time have a certain measure of leisure for discussion of problems with those working along similar lines. It would seem as though coöperation might result in the more economical handling of much of the business and

something be gained by the consolidation of a few allied organizations. One side of this problem was considered in the tentative discussion regarding the possibility of the economic entomologists affiliating with other organizations engaged in agricultural research. While this larger affiliation may be advisable, we believe that something must be done shortly to still further simplify the requirements of our annual meetings.

The following statements are by the Business Manager: Volume 1 of the JOURNAL OF ECONOMIC ENTOMOLOGY has now been successfully completed and it may interest our readers to know something of the present status of the Journal. We now have 485 paid subscribers in every state and territory except North Dakota and Wyoming, in all of the Canadian provinces and in thirty-eight foreign countries, there being eighty foreign subscribers. Six hundred copies of every issue have been circulated as guaranteed to our advertisers. The first year closed with a small balance, providing that all bills payable are collected. The actual printing of the Journal costs about $1,000. The publication of the Journal would be entirely impossible were it not for the support which we have received from advertisers, which has been due to the very efficient work of Prof. Wilmon Newell, state entomologist of Louisiana. During the past year about $500 worth of advertising was secured by Mr. Newell.

At the meeting of the Publishing Committee, it was voted that a most cordial vote of thanks be extended to Professor Newell for the great service that he has done the Journal and those interested in it.

There can be no question that the Journal is an excellent advertising medium for reaching the economic entomologists of the world. The returns from such advertising are, however, not as directly traceable as in the case of most advertising mediums, and we would urge our readers to show their appreciation of our advertisers by carefully reading the advertising pages and mentioning this Journal when doing business with our advertisers.

At the meeting of the Journal Publishing Company, it was decided to furnish Volume 1 to all new subscribers for $2 until our supply is reduced to 100 sets, after which the price will be raised and a certain number will be kept permanently for furnishing sets to libraries. As there are about 200 sets of Volume 1 now on hand, this means that the next 100 subscribers can secure Volume 1 at $2, after which the price will be advanced and without doubt Volume 1 will be difficult to secure before many years. If you have friends who are prospective subscribers, you will do them a favor by advising them of this fact.

Bills for Volume 2 will be mailed to all subscribers of Volume 1 and subscribers' names will be carried on our list until April 1. If remittances or orders to continue the Journal have not been received by that time, the names will be dropped from the mailing list, which is necessitated by the rulings of the post-office department. This explanation is made so that subscribers may advise us of their wishes as to the continuance of subscriptions.

There are many public libraries subscribing to some entomological journals, which should have this Journal. Those of our readers who can aid the business manager by suggesting names of such or by calling the attention of librarians to the Journal will confer a favor upon the management.

Obituary

FRANCIS HUNTINGTON SNOW

The recent death of Dr. Francis H. Snow removes from the ranks of American entomologists a medalled veteran of the service. It was in the '60s that Francis Snow, a boy of twenty-five, went out to Kansas from Massachusetts as professor of mathematics and natural science in the just-established state university at Lawrence. He was one of the three men who formed the entire first faculty of the embryo institution. The other two finished their work years ago, but Dr. Snow's call to rest was delayed until he was able to see a wonderful fruition of his labors.

With the addition of new men to the faculty Professor Snow was able from 1870 on to restrict his work to natural history and after 1886 to botany and entomology, his chief interest and activity from the first having been devoted to the collection and study of insects. In 1889 in response to the wish of all the people of the state, excepting himself, he was called to take the presidency of the university. This heavy load of administrative duty he simply added to his other work because he would not be driven out of his laboratory and museum. The university began under his administration that rapid growth which it has continued up to today. The double burden was successfuly sustained by him for eleven or twelve years, but at the end of that time, warned by symptoms of bodily rebellion, among which serious insomnia was a conspicuous one, Chancellor Snow gave back to the Board of Regents his charge of the university and devoted himself entirely again to the care and further increase of his great collections. It was as active director of the natural history

museum and emeritus professor of natural history that he died on September 20, 1908, aged sixty-eight years.

There is no space here to enumerate ever so compactly or fleetingly the special activities and successes of Professor Snow's career. He was the pioneer naturalist of Kansas, and for thirty years its most conspicuous representative in meteorology, botany, ornithology and entomology. Distinctly an old-time "naturalist," student of Nature in the field as contrasted with the newer type of laboratory "biologist," Professor Snow was at the same time a teacher and personal help and inspiration to students of a type only too rarely known in university circles. His love of birds and flowers and insects never obscured or overcame his love of his students. His enthusiasm and energy were contagious. He made first-class men out of the best of us, and something at least worth while out of the worst of us. The roll of "formerly of Kansas" men who are teaching and investigating in lines of natural history is a long one, and the list of Snow's students is a large part of it.

Dr. Snow's personal contributions to science are chiefly systematic, faunistic and economic. The gathering together and care of the remarkably large and rich collections of the University of Kansas are not to be reckoned as the least of these contributions. For though the effective aid of Dyche, Williston and others has been an indispensable part of the building up of these really notable collections, Snow was through it all a guiding, driving and inspiring spirit. For many years his was the sole activity. These collections now housed in a splendid special museum building are an abiding tangible evidence of Dr. Snow's capacity and enthusiasm.

The most conspicuous period of Professor Snow's entomological career was that of the early '90s when, under his control, Kansas tried on a large scale, with special appropriations from the Legislature, the artificial introduction of epidemic diseases among the chinch-bugs of her great wheat and corn fields. Our laboratories and offices were overrun by the hundreds of thousands of little black and white malodorous pests which were being sent in and out by daily scores of mail packages. The work and its results have been variously judged. We may admit at once certain mistakes in interpretation of results and certain failures in method. But all these concessions to just criticism do not cancel the positive results of benefit which certainly came through the wholesale spreading of fungous diseases that would otherwise have remained much more restricted in their range and effectiveness. With these immediate positive benefits, too, came the more indirect but perhaps larger one of the awakened in-

terest of the people in scientific insect-fighting, and the aroused attention of entomologists to the possibilities of this phase of economic work.

The rewards of honor that came to Professor Snow in his long, active life of student, teacher, university president and representative citizen need hardly be mentioned. From Williams College, his alma mater, he received an honorary Ph. D. in 1881, and from Princeton University the degree of LL. D. in 1890. His conspicuous part in encouraging local interest in natural history was recognized by his election five times as president of the Kansas Academy of Science. His personal acquaintanceship among the people of the state was extraordinarily large, and his place in the respect and affection of these people was evinced time and time again by public recognition, of one kind and another. In the days of the Populist control of the state administration, it is probable that it was only Snow's personal strength with the people that saved the university from such serious interference as befell the State Agricultural College. The dedication of the beautiful university building of natural history as Snow Hall, and the building, by special legislative action and appropriation, of a residence for his inhabitancy for life, were characteristic recognitions of his value to the university and the state.

But I must not give my pen more rein. My personal feelings I have given no rein at all. As student, assistant, colleague and intimate friend of Francis H. Snow for twenty-five years, I have in my mind and heart such a wealth of dear memory that I do not trust myself even a word or phrase of personal appreciation. If I should, it would be too extravagant for publicity, to insufficient for my own satisfaction.

VERNON L. KELLOGG.

PARIS, December 24, 1908.

Reviews

Manual of North American Diptera, by SAMUEL W. WILLISTON, p. 1–405, 161 figures. 1908. James T. Hathaway, New Haven.

The Diptera, or two-winged flies, are rapidly coming to the front on account of numerous forms previously almost ignored and now recognized as of great economic importance. The author has laid a heavy obligation on all entomologists in turning aside from other lines of work, to condense into this useful manual the experience of a lifetime. The value of the publication has been greatly increased by the coöperation of such Dipterists as Aldrich, Coquillett, Townsend and others. The large series of illustrations

gathered from the best available sources or specially prepared for the work, constitute a most helpful addition for the amateur. We regret that the author has not seen fit to include in this edition a bibliography of the more important works. Despite some minor imperfections, this manual must remain for some years at least, the standard work on Diptera, invaluable to the amateur, indispensable to the specialist and most illuminating to the general student of entomology.

James Fletcher, LL.D. Ottawa Naturalist, January, 1909. p. 189–234.

This memorial number will appeal most strongly to American entomologists. The major portion of the number is occupied by papers and testimonials given at a memorial meeting held December 1, 1908, Dr. Saunders, Mr. Harrington and Professor Macoun being some of the more widely known participants. There are many delightful references to incidents in the life of Dr. Fletcher, showing his great love for Nature, his unselfishness and, most striking of all, his ability to leave a wholesome impression upon all with whom he came in contact. Messrs. Gibson and Groh contribute a list of the published writings of Dr. Fletcher. This memorial number is a striking tribute to the large place Dr. Fletcher filled in the hearts of his friends. A life worthy of such a testimonial commands the admiration of all. The editor is to be congratulated on the general excellence of this issue.

Twelfth Report of the State Entomologist of Minnesota, by F. L. WASHBURN, p. 1–205, 1908.

This report contains valuable additions to our knowledge respecting a number of important insects. There is an extended discussion, illustrated by an excellent colored plate, of the apple leaf hopper, special attention being given to repressive measures. Grasshopper control is briefly noticed. Original biological data on the green aphis, *Toxoptera graminum*, the English grain louse, *Macrosiphum granaria* and other species are placed on record and control measures discussed. The report contains a record of the nursery inspection work, including a summary of the laws in force in other states. There is a general discussion of spraying, with notes on a number of injurious species, and special notice of some important shade tree pests. There are extensive records of experimental work with insecticides against the cabbage maggot. An unusual feature is found in the series of abstracts of entomological papers from the Experiment Station Record. Mr. R. A. Vickery is the author of an excellent paper on the anatomy of plant-lice. Mr. Brues describes a number of new parasites of the cabbage maggot, while Doctor Franklin characterizes the larvæ and pupæ of certain stalk borers. The report contains an excellent series of original illustrations.

Tick Eradication, by E. C. COTTON, Tenn. Agric. Exp't. Sta. Bul. 81, p. 53–71, 1908.

This comprehensive discussion of the cattle species is based upon two years investigations under Tennessee conditions. The life history of the tick is discussed in detail, the changes in the cycle being illustrated by a series of figures and diagrams. Pasture rotation and its applicability to common farm

practice is carefully discussed and the results obtained in Texas are described. There is also a comparison of the life histories and habits of the North American fever tick and the dog tick, in particular.

The Leaf Hoppers of the Sugar Beet, by E. D. BALL, U. S. Dep't. of Agric., Bur. of Ent., Bul. 66, Prt. 4, p. 33–52, 1909.

Doctor Ball's familiarity with this group enables him to discuss these species in an authoritative manner. The bulletin gives in detail the distribution and life history records of several species and discusses their relationship to the "curly-leaf" condition frequently found on sugar beets. Doctor Ball suggests several measures for the control of *Eutettix tenella* Baker, the species responsible for much of the injury. The bulletin is illustrated by an excellent series of plates.

A Brief Survey of Hawaiian Bee Keeping, by E. F. PHILLIPS, U. S. Dep't. of Agric., Bur. of Ent., Bul. 75, Prt. 5, p. 43–58, 1909.

This bulletin discusses in a summary manner the status of bee keeping in the Hawaiian Islands and gives a list of the honey-producing plants of that section. The value of the bulletin is greatly enhanced by a series of admirable plates.

Part 6, p. 59–80, of the above-cited bulletin discusses the status of apiculture in the United States and gives extensive tabular data showing the extent of this industry.

Control of Leaf Blister Mite in Apple Orchards, by P. J. PARROTT, N. Y. Agric. Exp't. Sta. Bul. 306, p. 417–38, 1908.

The author records extensive injuries by this pest and advises an early spring application of a lime-sulphur wash or a miscible oil. The recommendations are supported by experimental data obtained in various localities.

The Grape Leaf Skeletonizer, by P. R. JONES, U. S. Dep't. of Agric., Bur. of Ent., Bul. 68, Prt. 8, p. 77–90, 1909.

This is an extended biological account, illustrated by numerous original figures, of *Harrisana americana Guer.-Men.*, accompanied by an extended bibliography. The author advises hand-picking or the employment of arsenical poisons.

E. P. FELT.

A Revision of the Ixodoides, or Ticks, of the United States, by NATHAN BANKS, U. S. Dept. of Agric., Bulletin Bureau of Entomology, Techn. series No. 15, 1908.

This is a valuable and thorough contribution to this little known group, which is of recognized economic importance. Keys are given for the families, genera and species, each species being fully described, five proving to be new. There are ten full-page plates. Chapters are also given on structure, life-history, geographical distribution, abundance, historical and classification, and there is a synomical list of the North American ticks, together with a full bibliography. Very little systematic work has been done on this group and there is an excellent field for investigation.—KARL R. COOLIDGE.

The House Mosquito, by J. B. SMITH, N. J. Agric. Exp't. Sta. Bul. 206, p. 1–21, 1908.

This is an extended and thoroughly practical discussion of a very common species. Professor Smith has had exceptional opportunities of studying this and allied forms.

E. P. FELT.

Current Notes

Conducted by the Associate Editor

Mr. J. L. Randall is now engaged in teaching at the Pennsylvania State Normal School at California, Pa.

About May 15, the Hawaiian Board of Agriculture and Forestry expects to appoint an assistant entomologist. A man is desired who can take up work on Coleoptera or parasitic Hymenoptera as a specialty, and who has had some experience in laboratory and field work. The salary will range from $1,500 to $1,800 per annum, depending on the man. Correspondence can now be opened. Applicants should state their age, school attended, experience and give references. Address, Jacob Kotinsky, Superintendent of Entomology, Board of Agriculture and Forestry, Honolulu, Hawaii.

Mr. F. W. Lowe, until recently employed at the Gypsy Moth Laboratory in Massachusetts, has been appointed an assistant in the Bureau of Entomology.

Mr. Harry S. Smith, who has been engaged in investigating the parasites of the Cotton Boll Weevil, has been transferred to the Gypsy Moth Laboratory at Melrose Highlands, Mass.

Mr. Eugene W. Wall has been appointed an assistant preparator in the Bureau of Entomology.

Mr. H. L. Viereck has been appointed an assistant in the Bureau of Entomology. He will work principally on the parasitic Hymenoptera.

Prof. Braxton H. Guilbeau, professor of zoölogy and entomology at the Louisiana State University, and director of the Gulf Biologic Station at Cameron, La., committed suicide on Saturday, January 16, by shooting himself through the head. He leaves a wife and two young children. Overwork is said to be the cause of the calamity, Professor Guilbeau probably having become temporarily deranged.

Dr. S. A. Forbes, we note in the columns of *Science*, has resigned from the chair of zoölogy in the University of Illinois, the resignation to take effect September 1st. Dr. Forbes will continue to serve as State Entomologist and Director of the State Laboratory of Natural History.

Mailed February 15, 1909.